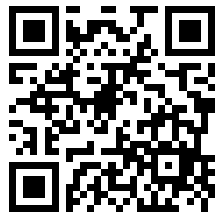
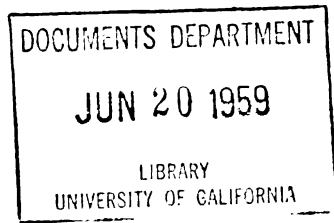

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Journal
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QUARTERLY

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CONTENTS

ORIGINAL COMMUNICATIONS	PAGE		PAGE
Medical Problems of the Operational Infantry Soldier in Malaya. By Major T. C. R. Archer, M.B., D.P.H., R.A.M.C.	1	Army Concepts of Forward Aeromedical Evacuation. Based on a paper by Colonel Thomas N. Page, Medical Corps, United States Army	35
Symposium on Influenza from Western Command	14	Surgery and the Mau Mau. By Lieut.-Colonel Wilfred Barber, T.D., M.A., M.B., F.R.C.S., R.A.M.C.	41
Le Val-de-Grâce Church, Hospital, Museum and Medical School. By Brigadier A. N. T. Meneses, C.B.E., D.S.O., M.D., M.R.C.P., D.T.M. & H.	22	Tetracycline Hydrochloride in the Treatment of Non-Gonococcal Urethritis. By R. R. Willcox, M.D.	44
Officer Training in the French Medical Services: l'Ecole du Service de Santé. By Captain A. V. Nash, R.A.M.C.	27	OBITUARY: Major-General Sir Courtenay Manifold, K.C.B., C.M.G., M.B.	47
Common Stresses in a Military Environment. By Captain H. L. Freeman, M.A., B.M., B.Ch., R.A.M.C.	31	Correspondence	48
		BOOK REVIEWS	13, 30
		EDITORIAL NOTICES	50

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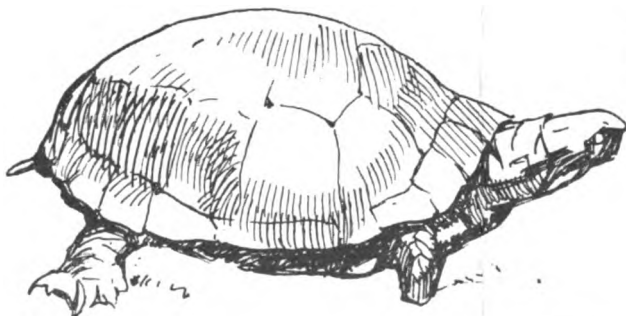
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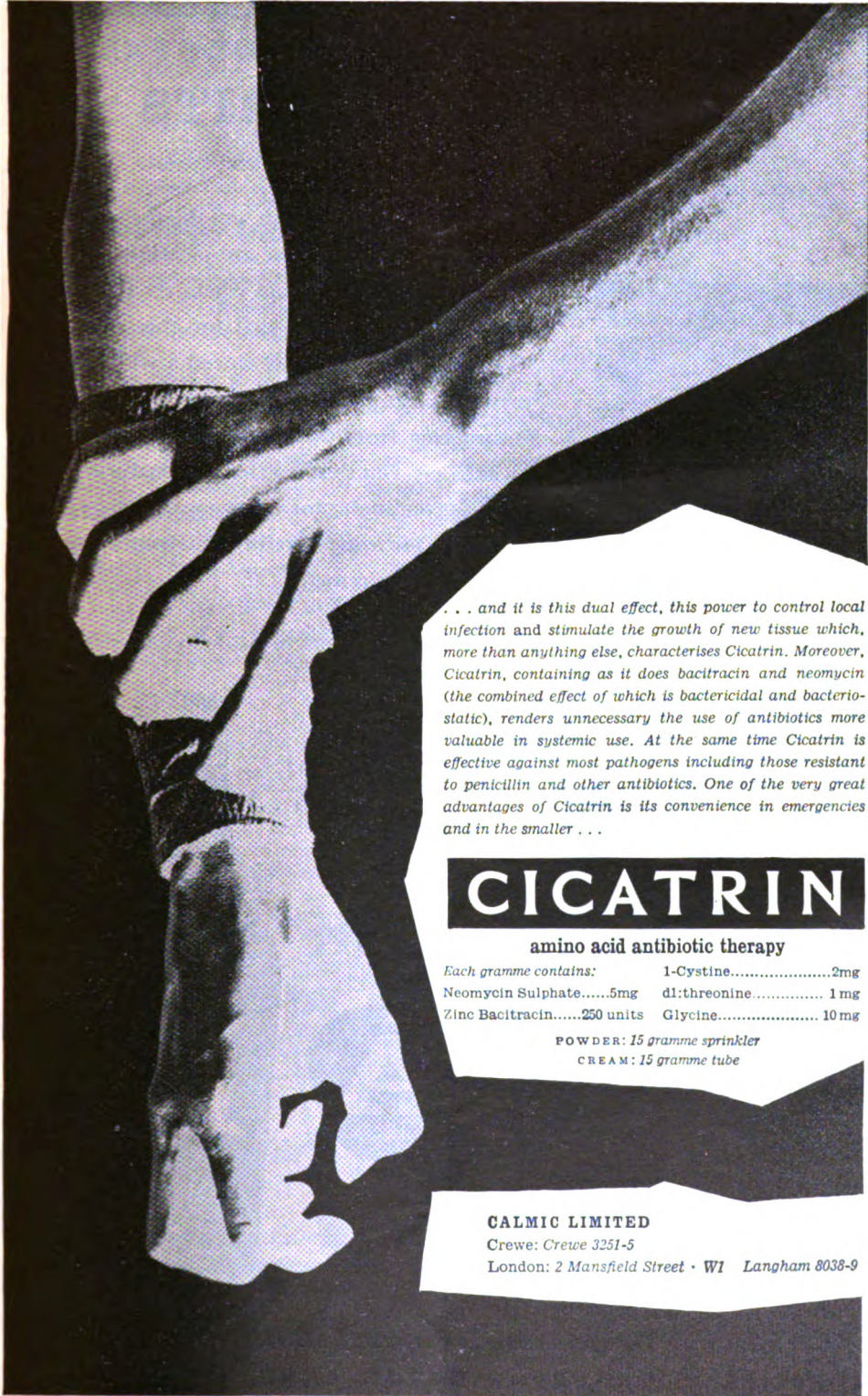
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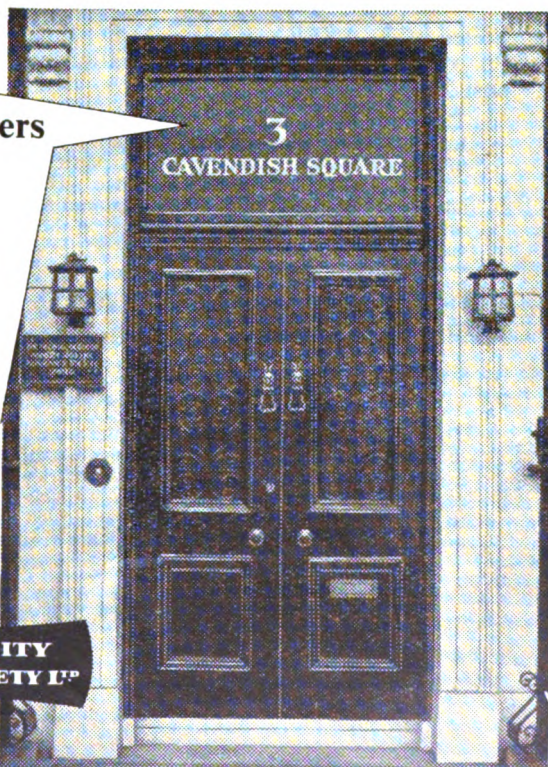
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Journal

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MEDICAL PROBLEMS OF THE OPERATIONAL INFANTRY SOLDIER IN MALAYA

BY

Major T. C. R. ARCHER, M.B., D.P.H.
Royal Army Medical Corps

FOR the last two years* the author has been medical personnel research officer to the Army Personnel Research Committee. His field has been the problems peculiar to the infantry soldier. In 1955 he made a six-month survey in Malaya of the problems of the soldier engaged in jungle operations against the Malayan communists. After preliminary training in jungle warfare at the Far East Land Forces Training Centre, Kota Tinggi, he took part in a number of operations, thereby gaining first-hand experience of the soldier's life in the jungle. The aim of this paper is to give a brief outline of the major problems encountered. The term "medical" has been interpreted in a very broad sense and includes anything peculiar to this type of warfare which adversely affects human performance.

Malaya is a peninsula stretching south-east for 400 miles from the southern border of Thailand towards Indonesia. At the broadest part it is 200 miles wide, and in area is about the same as England and Wales. Running almost the whole length of the country is a backbone of jungle-covered mountains rising up to 7,000 feet. Four-fifths of the country is a trackless evergreen forest: a hundred feet above the ground the trees make a solid roof of greenery shutting

* Written in 1956.

out both sun and sky. From the trees curtains of vine and creeper run down to the undergrowth to make a jungle so dense that a standing man is invisible at 25 yards. Water is usually plentiful, the country being covered with a dense network of streams and fast-flowing rivers. In many parts, especially near the coast, the jungle contains large areas of swamp, making the country even more difficult to penetrate. About one-fifth of the country, mainly on the western side of the mountain range, has been developed into rubber estates (which resemble large orchards), rice fields, tin mines, many small villages and a few towns. The climate shows little variation throughout the year. In settled areas on the plains noon temperatures average 90° F., falling to 70° at night. Winds are light and rainfall heavy, a daily downpour in the afternoon or evening, perhaps with a severe thunderstorm, being usual. These conditions result in a hot, humid atmosphere. Personal observation in the jungle indicated rather lower maximum temperatures, in the region of 80° F., with a rather higher humidity, as might be expected.

Since 1948 the Malayan communists have been waging a guerilla war in order to gain control of the country with its valuable tin and rubber industries. The original aim was for armed bands of communists based in the jungle to prey on the settled areas to such an extent as gradually to take control of the country. The campaign has tended to move the other way, the armed bands being forced deeper and deeper into the jungle and broken up into smaller and smaller groups. In 1955 it was estimated that not more than 4,000 armed communists remained of an original force of two or three times that number. These men are spread out all over the country in bands not more than twenty strong. Their elimination is the army's principal task in Malaya; a difficult, lengthy and tedious one as the communists will not stand and fight unless local conditions are overwhelmingly favourable to them. Army operations usually take one of two forms. The first is the laying of an ambush in an area which intelligence reports indicate that the communists will be visiting. These ambushes may have to be manned continuously for weeks at a time before being successful. They require careful planning and immense self-discipline to maintain them in the absolute silence which is necessary. They are the most profitable method of eliminating communists.

The second type of operation consists of a systematic search of an area of jungle which is believed to contain communists, coupled with their elimination, before they succeed in making their escape. The usual plan is to move into an area of jungle without being seen by the local population (who include communist sympathisers in touch with the armed bands in the jungle), set up a base camp and carry out one-day patrols from that centre. To the individual soldier the returns from this perpetual patrolling would appear to be very small, though over the years a great deal of the country has been cleared successfully. It is estimated that it takes 1,000 hours of patrolling for every contact made with the enemy. Operations usually last about ten days but may extend up to a couple of months. The unit usually employed is the infantry platoon operating as an independent unit for the period of the operation. A common routine is for the

infantry company to be based on the jungle edge (in a rubber estate, for example), and to send its platoons on patrol continuously in rotation. To the individual soldier life consists of operations involving considerable physical exertion in a hot, damp, dirty forest environment, interspersed with short spells (usually not more than four days) of rest, re-training and re-equipping in the company base, which is usually a primitive temporary camp. Jungle operations tend to result in a monotonous existence, rarely disturbed by short periods of intense activity, when contact is made with the enemy.

DISEASES

Skin disease. Disease plays a much smaller part than in earlier campaigns in similar country, such as the Burma campaign of the Second World War. The predominant disease now is tropical skin infection which is almost universal in operational units, either appearing during, or being aggravated by, jungle operations. Practically every man suffers from skin disease of sufficient severity to require treatment at least once during his first year of service in Malaya. The majority only need treatment in unit lines whilst remaining on full duty; a small number are severe enough to warrant light duty for up to ten days, and a few have to be treated in hospital. This group of diseases makes up the largest single cause of hospital admission in Malaya. Thus the average figure for the twelve-month period August, 1954 to July, 1955, was 46 per 1,000 per annum. The corresponding number of *new* cases of skin disease in a unit was about 1,000 per 1,000 per annum.

Ringworm (usually of the feet) was the commonest disease seen, followed by secondary infection of abrasions or bites (scratches, thorns, mosquito or leech bites), furunculosis, bullous impetigo, and prickly heat. The individual soldier's experience of ringworm tended to follow a certain pattern. After about three months' service in Malaya it appeared as an infection of toes or groins or both, usually whilst on operations. Unless treated promptly, a generalised body infection resulted. Prompt treatment with a fungicide (usually Castellani's paint or Whitfield's ointment) controlled the condition, leaving a chronic focus visible between the toes. Thenceforth ringworm was liable to flare up whenever the man had been in the jungle for a few days, though subsequent attacks were not usually so severe and were easier to control, but no easier to eradicate entirely. Personal observation indicated that there was very little increase in the incidence of ringworm for the first ten days of an operation, but thereafter it was considerable in spite of fungicides. A few of these cases (5 per cent) would require immediate evacuation from the jungle, though the majority could be kept at full duty with treatment, but their lesions would not heal until after return to civilisation. Cuts, abrasions, and scratches on exposed areas of skin were universal and became septic almost without exception although they were rarely serious enough to put a man off duty. To try to reduce this, the experienced wore their sleeves down and buttoned at the wrist in spite of the heat. Furunculosis usually occurred in those areas normally covered by clothing,

and once present was a very difficult disease to control under jungle conditions, being liable to spread rapidly all over the body. The large jungle sores so common in the Burma campaign were not seen. The high protein content of the rations may have been an important factor in their prevention. Bullous impetigo did not appear to be such a serious problem as among troops in permanent barracks in base areas. The lesions usually started in the axilla with rapid spread to the chest and abdomen. Secondary infection of a pre-established acne was universal. Prickly heat appeared to be uncommon except in recent arrivals from Europe.

It is interesting to try to analyse jungle warfare and conditions to determine the factors responsible for the higher incidence of skin disease in the jungle. Most operations take place in an atmospheric temperature of 80° F. combined with a relative humidity in the region of 90 per cent. This means a high skin temperature and a constant film of visible sweat on the skin as air movement is very slight in the jungle. This is aggravated by the hard physical exertion necessary, the covering of most of the body by clothes, and the lack of sunlight. Unlike the local forest aboriginal, the soldier must cover most of his body for camouflage and protective purposes. In the present type of operation this means the wearing of damp or wet clothing for at least eight hours of the hottest part of each day. The foot endures an even hotter and moister micro-climate, being covered in damp woollen socks closely invested by calf-length canvas jungle boots with rubber soles. It should be explained that on most operations clothing and footwear become soaking wet within an hour or two of the start on the first day, from sweat, rain, or wading through swamps or streams. The soldier wears this wet clothing for working in every day, changing at night (after a bath in the nearest stream) into a spare dry set to sleep. The effect of wet clothing is aggravated by pressure of clothing and equipment, as shown by the frequent and early appearance of ringworm at the waist and on the dorsum of the foot under the laceline of the boot. The jungle canopy excludes practically all direct sunlight from the man on the ground. This makes the jungle relatively cool but excludes the beneficial effect of the sun in tanning the skin and evaporating sweat. The European develops a dirty white complexion after as little as ten days in the jungle. The incidence of skin disease tends to be higher in flat, muddy, swampy areas than in the hill country though the latter calls for much greater physical exertion. Apart from the higher temperature and humidity, dirt and a disinclination to wash in muddy water are probably important. The exposed skin and legs are subjected to constant trauma; abrasions, bruises, thorns, insect and leech bites are universal. Even with the utmost care the author was unable to avoid large numbers of them himself.

At present the only prophylactic measures available are early treatment, daily washing, and the use of foot and body powder to dry up the skin. Personal experience indicated that these measures were insufficient even if conscientiously carried out, which was not always possible owing to lack of time, fatigue, or lack of water. A jungle operation is always a race against time; the maximum possible period must be spent in searching for the enemy and it is rarely sufficient.

This means that the time set aside for domestic duties is reduced to a minimum. From the end of the day's work at about 4 p.m. to dusk is about three hours. During this time the evening meal must be prepared individually, and eaten, weapons cleaned, personal hygiene (which includes washing and changing into dry clothes) carried out, medical treatment given, and instructions issued for the next day. Next morning, work will commence within an hour of dawn to make the most of the coolest part of the day and of the time available.

Three other factors influence the incidence of skin disease. These are the type of socks worn, the standard footwear used when out of the jungle, and the primitive living conditions of the company base camps. The standard army woollen grey sock is in general use in Malaya. This may become a reservoir of ringworm capable of reinfesting the wearer's feet. It is difficult to disinfect without actually destroying the sock. The sock has another defect which to a certain extent reduces the importance of this: it tends to shrink very rapidly under jungle conditions, often to such an extent as to be far too small to wear after as little as ten days' use. Trials of nylon and terylene socks (which are believed to be capable of sterilisation by boiling and to be shrinkproof, but otherwise identical with wool) are now being undertaken. The standard army footwear outside the jungle is woollen socks, leather boots, woollen hosiery, and short woollen puttees. A hotter covering for the foot is difficult to imagine, especially as the hosiery are usually dyed a dark colour. There is need for a cooler form of footwear such as the *chapli* or sandal for all occasions except work in the jungle, ceremonial parades, and guard duties.

Company base camps are usually tented, with corrugated-iron shelters for cookhouse, dining hall, and sanitary annexes. In most cases a piped water supply and cold showers are available; sanitation is usually borehole or deep-trench system. Laundering is done by hand by local labour giving up to two washes per week. The simplicity of these conditions may answer the question as to why skin disease in the tropics is so common in the soldier (whether engaged in jungle operations or not; though its incidence is much higher in the former) and so rare in the civilian who lives in much better surroundings. Unfortunately, these camps must of necessity be simple as they are moved fairly frequently for operational reasons.

Malaria no longer presents the major problem it did during the last war because paludrine provides an effective measure of control. Investigation of so-called "paludrine resistance" in army units indicated that it was not being taken as frequently as directed. Insect repellent is used only where mosquitoes are troublesome, such as in swamps and rubber estates, and not as an anti-malarial measure. The face veil and gauntlets are frequently employed by ambush parties lying up in mosquito-infested areas, but are not otherwise in general use. Mosquito nets are sometimes used where the mosquito menace is severe, such as in swamp country, but are considered too heavy for general use. Gurkhas provide an interesting exception here, frequently carrying one net between two men and using it as a means of keeping warm in the hills at night. This method does not appeal to the European soldier!

Intestinal disease provides no real problem because the jungle soldier is operating far removed and well upstream from villages and towns, which are the chief sources of infection. This is just as well as the Malay villager uses the local stream as both water supply and latrine.

Leptospirosis has appeared as a major medical problem and is almost entirely a military one, confined to the soldier operating in the jungle. It is now well known to him and probably the disease he fears most, although the incidence tends to be somewhat exaggerated as he labels any serious febrile illness leptospirosis. Because of the lack of prophylactic or specific treatment it remains a serious condition. In 1954 there were 150 proven cases with two deaths. The disease usually entails a period of three weeks in hospital, followed by two weeks' convalescence. Case incidence showed a close relationship to operations in muddy and swampy areas. It is believed that infection occurs either through an abrasion in the skin when washing or wading in infected water, or by drinking unsterilised water from an infected source.

Scrub typhus is still an important cause of morbidity with an annual incidence of about 120 cases. The use of mite-repellents and treatment with chloromycetin have robbed the disease of the formidable reputation it enjoyed in Burma during the last war. Investigation in Malaya indicates that many cases were associated with failure to carry out the mite-repellent drill correctly. For example, failure to use mite-repellent at all from ignorance or laziness; failure to re-impregnate frequently enough on lengthy and wet operations, and the clothing received as replacements whilst in the jungle not being impregnated before use. The present method of impregnation is laborious and requires frequent repetition. There is room for a more persistent and more easily applied repellent. The other important measure used in Burma is not employed nearly enough. Men do not as a routine sleep off the ground in a hammock or on a platform of saplings as do the communists. Apart from the value of this in preventing scrub typhus, it is by far the most comfortable and dry way of sleeping in the jungle. It is quite safe in this type of warfare as the enemy rarely attacks a camp.

MEDICAL COVER

The chances of being killed or wounded by enemy action in this type of warfare are very small; the incidence of accidental injury and disease which requires evacuation from the jungle is a much bigger and constant problem. Until the advent of the helicopter the problem of maintaining effective and yet economic medical cover was wellnigh insoluble. It was impossible to provide sufficient skilled medical staff to accompany all of the many platoons operating daily throughout the country. The moving of a casualty to hospital might involve several days' march through very difficult country, followed by several hours by road or rail. The helicopter has changed all this. Serious cases can be lifted straight from clearings (of which there are now many) direct to hospital, usually within a couple of hours. If necessary, doctor and emergency equipment can

be brought to the patient in the jungle. Routine platoon medical cover has therefore been much reduced. One member of each platoon is trained in first-aid by the R.M.O. or the supporting field ambulance and acts as medical dresser in addition to his other duties. He carries a haversack of dressings and fungicides. In addition, the platoon commander and his section commanders each have a small first-aid kit ("J" pack) which contains morphine syrettes, codeine, sulphonamide tablets and elastoplast dressings, together with instructions for dealing with major emergencies. These have proved invaluable. The platoon commander can consult his R.M.O. by wireless; to simplify this the doctor is often flown over the platoon's position in a light aircraft, carrying on a consultation by wireless, or is taken by helicopter to see the case. Another but rather hazardous method of providing medical aid has been developed from the Special Air Service medical officers who are trained parachutists and have on occasions been dropped by parachute into the jungle to reach casualties far removed from helicopter clearings. Casualties in jumping personnel are heavy. The aim is to land in a tree and then drop the remaining one to two hundred feet by means of a line carried for the purpose. The danger is that the parachute does not always catch securely in the tree and the parachutist drops freely anything up to two hundred feet to the ground. In passing it may be mentioned that helicopters are extensively employed for lifting troops in and out of the jungle, thus saving a great deal of physical effort and enabling much deeper penetration into the jungle. Their major drawback is that they may reveal the presence of troops to the enemy.

HEALTH AND HYGIENE

Individual fitness for jungle operations. Working in the jungle demands a high standard of physical and mental fitness. Physique itself must be adequate but need not be that of a superman. Defects of locomotion and skin disease are the commonest causes of temporary rejection for jungle operations. The permanent wearer of spectacles is also at some disadvantage because of the liability of his lenses to steam up. Stature is also important, the tall man being at some disadvantage in moving through the thick jungle. Mentally, jungle operations are depressing by reason of their monotony, apparent lack of success (the rare contacts with the enemy always raise morale sky-high), the hot humid climate, and the feeling of being continuously enclosed by an overhead curtain of trees. For success, noise must be reduced to a minimum whilst in the jungle. The soldier is therefore trained to carry out all conversation in a loud whisper and not to phonate. The naturally talkative young soldier finds this extremely difficult and somewhat of a strain. The author on the other hand, found that the habit, once acquired, was very liable to continue when back in civilisation, with amusing effects on his companions. Actual fear of the jungle appeared to be rare. This may well be due to the sound preliminary training given, the slight risk of being killed or wounded, and the ready contact with the outside by helicopter in case of emergency. One aspect which was sometimes forgotten was the need for regular spells of leave, especially for the

junior officer and N.C.O. This type of warfare provides excellent training for the junior leader, but staleness is inevitable after months of jungle operations. The jungle soon discovers those who are unfitted to lead; luckily these are few, but they do occur in spite of the present extensive personnel selection procedure. Age appears to bear an important relationship to fitness for jungle operations. The optimum would appear to be about 25 years with a maximum of 35 years, though there are notable exceptions. Under 25 the man lacks maturity, whilst over 35 he lacks staying power; he is slower on the march, tires more easily, takes longer to recover after an operation, and is unable to carry as heavy a pack or climb hills with such ease.

The problem of National Service affects the campaign in Malaya as elsewhere. Jungle warfare demands team work by every platoon engaged if it is to be successful. The British platoon is always changing as men leave for demobilisation and are replaced by others; the man is just becoming an expert in jungle warfare as he is returned home. The results therefore do not always measure up to those obtained by the Gurkhas, for example, and lead to the British soldier perhaps unfairly being compared to his disadvantage.

Acclimatisation. The present programme gives the newly arrived soldier a period of four to six weeks' training before he is committed to operations. During this time he is trained in the technique of Malayan jungle operations which includes instruction in jungle living and personal hygiene. Physical exertion is gradually increased during this period until at the end he takes part in a training operation of three or four days' duration in the jungle. Heat exhaustion is liable to occur during this training period and a careful watch is kept, stress being laid on adequate fluid and salt intake. A few mild cases do occur in spite of these measures, but rarely severe enough to require treatment in the medical centre. The reinforcement arriving in Malaya by air (three and a half days' travel from Europe) presents a special problem. For the first seven to ten days he is adjusting to the rapid climatic change and alteration in his diurnal rhythm (Malaya is seven and a half hours ahead of G.M.T.). During this period he is often unfit for training, but once the adjustment is made he is much fitter than the man who has come by sea. This leads to the interesting problem of how to produce airborne reinforcements fit to fight the moment they land in the tropics.

Heat exhaustion in the jungle appears to be rare except under conditions of extreme exertion. It was observed by the author in two sets of circumstances, one during an operation which involved much climbing in the hills, and the other when very heavy packs (100 lb. or more) had to be carried on a special operation. It is worth noting in this connection that the wet bulb temperature in the jungle approaches but does not appear to exceed the critical 83° F. In open, unshaded country the position is very different, the risk of heat exhaustion being very much greater. On operation this is reflected in the exhausting effect of travel through open country such as scrub, *lallang* (high grass), and large clearings in the jungle. For this and operational reasons the experienced soldier always skirts such clearings.

The soldier's pack. Reducing the weight of the equipment the soldier has to carry and improving the way he carries it have exercised both military and scientific authorities for many years. The problem appears to involve a vicious circle: as soon as the equipment is reduced to the physiological optimum, then there is a military requirement to increase it again by the addition of extra items. This is what has happened in Malaya. The man must carry everything he requires on his back. The country is too thick for animal transport; the man must usually carry all his food, mess-tins to cook it, spare dry clothes for sleeping in, poncho for making a bivouac, arms and ammunition, and a mass of small items such as washing gear and insect-repellent. Considerable thought has been exercised locally in Far East Land Forces to reduce the weight of the load carried and make the method of carriage as comfortable as possible. Every item thought necessary has been carefully reconsidered both officially and unofficially. Unfortunately, this has often meant that items used for personal hygiene have been discarded by individuals; for example, shaving gear and foot powder. In one unit visited by the author, the only spare clothing carried by one man was a pair of shorts and sand shoes. The individual wrapped himself up in a piece of parachute cloth to sleep at night. For medical reasons this appeared unsound as it was frequently associated with fibrositis, though the saving in weight was quite considerable. Efforts have been made to replace heavy items by lighter ones with the same or similar function. Two examples will illustrate this point. The machete is an essential part of the jungle soldier's equipment: for clearing camp sites; for making a path through the undergrowth on occasion; and as a close-quarters weapon, for the bayonet is not carried. The standard machete is too heavy and too long (length $17\frac{1}{2}$ inches) and it is being replaced by a smaller and lighter model. The poncho is essential for bivouac making but is rather heavy, 4 lb. when dry and perhaps half as much again when wet. Individuals have replaced it by a length of light impermeable plastic, suitably coloured. This may not last quite as long as the poncho, but its weight is not more than 2 lb. The standard load carriage equipment is the 1944 pattern with haversack. It is not usually worn as originally designed. The haversack is carried like a rucksack supported loosely from the shoulders by looped straps, being carried as low as possible so that as much of the weight as possible is taken on the loins rather than on the back and shoulders. The remaining equipment, such as the machete, water-bottle, and ammunition pouches, are carried on the waist-belt unsupported by braces and pouches as in the standard assembly of the equipment. The advantages of this assembly are that the pack can be removed rapidly if contact is made with the enemy, the weight is kept low and as near to the centre line of the body as possible where it is the least fatiguing to carry, there is no constriction of the chest by braces or pouches, and the weight of the braces is saved. Unfortunately, the haversack is too small to carry everything; some of the larger items are therefore strapped beneath the poncho. This involves careful and time-consuming packing to ensure that everything is included and that items such as spare clothing are packed in such a way as to keep dry. The Bergen rucksack is occasionally available as an alternative and is

much sought after; everything can be packed quickly and kept dry; it is comfortable to carry though it does induce a rather unnatural posture, the wearer having to lean forward as he walks in order to maintain his centre of gravity. Whatever type of pack is used, it must have a smooth posterior silhouette otherwise it will continually catch in overhanging vines and creepers.

Rations. Rations are one of the major limiting factors in determining the length and scope of jungle operations. With the present packed rations the soldier is unable to carry more than five days' requirements at a time without excessive fatigue and risk of heat exhaustion. The usual routine is for the man to march into the jungle with food for five days, and then be resupplied every further five days by parachute. This system has the disadvantages that supply dropping gives away the position of the troops to the enemy and that time is required to clear an area of jungle for the dropping zone. The rations commonly used by British troops are the U.K. packed individual 24-hour ration, the U.K. packed five- and ten-men compo packs, and the Singapore packed individual 24-hour ration, with individual hexamine tommy cookers issued to scale. Nutritionally all these rations are excellent. The author carried out a number of nutrition surveys on troops who had been living on these packs for periods of up to two months and could find no evidence of malnutrition, nor were there any complaints of insufficiency.

The disadvantage of all these rations is their weight, for at least 4 lb. of food is required daily by each man. The rations contained much tinned food and naturally attempts have been made to produce lighter packs of dehydrated foods. So far these have not been successful because of their inadequate nutritional value and poor palatability. There is a field for research here. Another approach to the problem has been to see whether man can live off the jungle. This has not proved a practical proposition for a group as large as a platoon. The aboriginal who is a permanent forest dweller supplements his hunting and fishing by clearing areas of jungle and planting them with some easy-growing carbohydrate food such as tapioca. In order to gather sufficient for his needs he has to hunt for most of the day, which is impractical for troops who have other duties to carry out. The communists originally arranged food supplies from villages adjacent to their jungle lairs. These have been interrupted in most areas and they have had to resort to arrangements similar to those of the aboriginal.

The soldier's taste in food shows interesting changes from Europe. The carbohydrate items (Service biscuits, steamed puddings, jam, dehydrated potato, and sometimes sweets) of the U.K. packs are not popular and often discarded, being replaced by locally purchased rice. Tinned stews are commonly curried, and there is also a greater demand for tea rather than cold drinks such as lemonade. To cater for these changes the Singapore pack was introduced. It substitutes rice for biscuits, eliminates jam, and includes curry powder and extra tea, milk and sugar.

Water purification. Water purification in the jungle is performed by each man using the individual water sterilising outfit and the two-pint water-bottle.

Filtration is rarely done unless the water is muddy, when an improvised filter may be made from cloth or gauze. The Millbank filter bag is neither used nor well known, and as filtration is not always necessary in Malaya, the bag would soon be considered a luxury and would be discarded unless the local supplies were muddy. Water sterilisation is by no means universally carried out. The reasons advanced for this were the low incidence of water-borne disease (even when leptospirosis is included), the unpleasant taste of chlorinated water, and lack of confidence in the Halozone tablet owing to its instability in tropical climates. To save weight only the bottle of sterilising tablets is carried, the detasting tablets and outer tin being discarded. There is a requirement for a sterilising agent which is stable in the tropics and is packed in a more suitable container than the present bottle. It is understood that this is being developed, using Chloramine B in place of Halozone.

Insect and similar problems. Insect repellent becomes less persistent in a hot, humid climate, and lasts about three hours instead of the usual eight. It is difficult to see how this can be improved as heavy visible sweating is responsible for washing away the repellent. Flies become a problem in jungle camps which are occupied for more than two or three days at a time. The danger points are the latrines and refuse pits as facilities and time are rarely available for making deep-trench latrines. The most satisfactory system seen was the daily digging of shallow-trench latrines. A number of units did not even do this and indulged in defæcation in the surrounding jungle, which is dangerous from the point of view of hygiene and security. Men have been shot by the communists when carrying out such a practice. Hornets are commonly encountered and are very aggressive, especially in the vicinity of their nests, which are therefore best avoided. Apart from the painful sting, severe anaphylactoid reactions are not uncommon with multiple stings and were seen on two occasions by the author. Both patients required evacuation out of the jungle. The leech has a fearsome but unjustified reputation with the British soldier. Its bite may be the site of secondary infection and it has been known to cause obstruction by invading the urethra. Serious hæmorrhage even after being bitten by the giant bull leech was not seen, but was reported by other observers. The liberal use of mite- or insect-repellent to the boots before going out on patrol each day was fairly effective protection. Other simpler measures included rubbing the footwear in carbolic soap or smearing it with some acid fruit such as fresh lime. Red ants are common and usually collected by brushing against a bush which has been invaded by them. The bite is unpleasant enough to demand the instant shedding of all clothing and the removal of the insects. In the flat swampy areas, large horse-flies abound and give rise to painful bites. Insect-repellent gives some protection. The normal prey of these flies is thought to be the wild pig as there are no horses. Scorpions are relatively rare but may be expected in dead trees and old huts. Snakes were seen infrequently and were no great problem. Of wild animals only two caused any real concern: the Sladang or Malayan wild buffalo, which is always best avoided, and the wild elephant, which has attacked man on a number of occasions, usually with fatal

results. The Musang or jungle cat is a frequent night visitor to jungle camps, looking for food in the refuse pits. It has an unpleasant bite but rarely attacks. It is trapped for food, though the meat is rather too strong for European taste.

CONCLUSIONS

In spite of the great advances in preventive medicine during the last few years there are still a number of major problems to solve. In Malaya tropical skin disease would appear to be the most important. The requirement is some relatively simple measure which will make the European skin immune to ringworm and secondary infection in a hot, humid climate. Preferably this should not depend entirely on individual human effort to be effective. This requirement might be even more important in major war in the tropics. Conditions in Malaya now are relatively mild when compared with those which might be expected in such a war. Men would not be able to wash daily; they would not be able to change into spare suits of dry clothing at night; it is unlikely that they would be able to sleep above the ground; and they might well have to march much greater distances than they do at present. Suggested lines of approach are the production of a systemic immunising agent against ringworm, or the employment of some substance similar to Undecylenic acid in action, either impregnated into clothing or applied as a paint or dusting powder.

Leptospirosis provides a big field for research. The ideal requirement is a specific immunising agent, although this may be difficult to achieve as no fewer than twenty pathogenic strains of leptospira have been identified in Malaya. The production of a specific therapeutic agent analogous to chloromycetin for the treatment of scrub typhus would appear more hopeful of success.

The rapid acclimatisation of airborne reinforcements to the tropics presents an interesting problem for the future. Conditioning in hot-houses may be the answer.

Malaya has indicated the need for a new water sterilising agent which is being developed. The ideal load-carrying equipment for the soldier has still to be found. The requirement in Malaya is somewhat specialised, but gives the pattern needed for guerilla and other special operations in the tropics where normal supply services are not available. The simplest and most useful modification to the present equipment would be the replacement of the present haversack by the large pack originally designed for use with it. This is in general use by the Malayan Police Field Force and on personal trial was most satisfactory.

As in Europe, there is need for a much lighter packed daily ration to make the soldier less dependent on his supply organisation and, in Malaya, to extend his range of action. The problem will be to maintain nutritional value and palatability. Dehydrated foods present the greatest promise as water for re-constituting is plentiful in Malaya. There is considerable room for improvement of repellents. The insect-repellent requires to be more persistent in a humid tropical country, and the mite-repellent should be easier to apply and more persistent than dibutyl-phthalate.

As regards personnel problems, the question of staleness, especially in leaders, is important, regular leave being a most valuable antidote. The relationship of age to fitness for jungle operations is also interesting and one which merits further study. Another personnel problem which has not been discussed but which often creates difficulties is the housing of families of regular soldiers of operational units. Because of lack of accommodation, the family may be forced to live some considerable distance (often over 100 miles) away from the husband, and only be reunited for a few days every six weeks or so.

The author would like to acknowledge the help he received both in the United Kingdom and Malaya in carrying out his unusual and interesting task.

Book Reviews

GUERRILLA SURGEON. By Lindsay Rodgers, M.B.E., F.R.C.S. London : Collins. 1957. Pp. 254. Illustrated. 18s.

Truth is stranger than fiction. To a surgeon, and in particular to one who may have visited Yugoslavia since the war and knows something of the country and its peoples, this book is fraught with interest. To any reader it is a remarkable story, and tells something of the birth pains of a new country in the hands of a terrible enemy. Apart from the story it tells, between the lines there is much food for thought for those who have come to distrust politics and politicians.

A. G. D. W.

SURGERY IN WORLD WAR II ; ORTHOPEDIC SURGERY IN THE MEDITERRANEAN THEATRE OF OPERATIONS. Editor-in-Chief : Colonel J. B. Coates, Jr., M.C. Editor for Orthopedic Surgery : Mather Cleveland, M.D. Washington, D.C. : Office of the Surgeon-General, Department of the Army. 1957. Pp. 368 + xx. Illustrated. \$4.

This work is from the office of the Surgeon-General, Medical Department, United States Army, and is the official record of orthopædic surgery in the Mediterranean Theatre in the last war. Nothing more need be said except that it attains the accustomed high standard of such publications and should be studied by all interested in military orthopædic surgery.

A. G. D. W.

A SYMPOSIUM ON INFLUENZA FROM WESTERN COMMAND

THE following is an account of a symposium on influenza held at the Military Hospital, Chester, on Friday, 4th October, 1957. It is not a verbatim report, but rather a summary of the main points brought out by the various speakers.

The object of the symposium was to present to medical officers the epidemiological, clinical and laboratory aspects of influenza as observed in Western Command during the outbreaks of the preceding eight weeks, and to remind them of the more common forms which the disease may assume in its various manifestations and complications, as well as of the pitfalls to be avoided.

The Chair was taken by Colonel E. J. Curran, C.B.E., officer commanding the hospital, who introduced the speakers.

EPIDEMIOLOGY

Colonel T. A. Pace, Deputy Director of Army Health, Western Command, opened the discussion with a brief survey of the current outbreak of Asian influenza. He traced the world-wide spread of the disease from its first appearance in April, 1957, in Hong Kong, which it might have reached from the interior of China. By the end of that month it had appeared in Singapore, and by the end of May widespread outbreaks had occurred in Malaya, Indo-China, Indonesia, Borneo, the Philippines, Formosa and Japan. India and Pakistan were affected early in June, followed shortly after by Mauritius and Australia. In Europe the first case, a traveller from the Far East, was reported from Holland in June; by the end of the month the disease had appeared in Roumania, subsequently spreading to Turkey, Germany, Greece, Italy and Malta. In August epidemics were first reported from Africa (Libya), and later from Nigeria, Egypt and the Sudan. In the United States the virus was first isolated towards the end of July, from students who had arrived from Holland, and in the following month outbreaks were notified from South America. In the United Kingdom the new virus was first detected in a Pakistani, a sailor who had arrived from West Pakistan by air on 13th June.

In Western Command the first outbreak occurred at Long Marston, Worcestershire, in mid-August, and by the end of that month outbreaks had been reported from garrisons in or near Ashton-under-Lyne, Brecon, Chester, Donnington, Preston, Rhyl and Wrexham. By the beginning of October practically every garrison in the Command had been affected.

The main features of the present outbreaks, apart from the unusual time of their appearance, were the mildness of the disease and the low case fatality rate, which included a relatively high number among schoolchildren and middle-aged adults. The attack rates had varied from 10 to 40 per cent of the populations affected. In Western Command the overall morbidity rate to date was approximately 12 per cent with only one death. (Note: Corrected notifications up till 6th October give an attack rate of 13.7 per cent. Between 12th August and 3rd

November, when the epidemic was considered at an end, the attack rate was 17.3 per cent, and there were three deaths.)

Stuart-Harris (1947), classified years into three main types from the point of view of influenza mortality, namely those in which the following occurred :

- (a) Sharp peaks of mortality with more than 1,000 deaths per week.
- (b) Irregular plateaux of mortality above 100, with a maximum of 200-400 per week.
- (c) Weekly deaths, never above 100 at any time.

In England and Wales there were 47 deaths from influenza during the week ending 14th September (the last week for which figures were available) compared with 8 for the preceding week. (Note : Deaths from influenza during subsequent weeks until the week ending 2nd November were 121, 282, 442, 591, 600, 396, and 263 respectively.)

It was a very interesting fact that both in Holland and the United Kingdom antibodies to the Asian strain had been found in people aged over 70. Could this be a possible link with the widespread influenza epidemic of 1889-90, which was also of a mild character and which had started in Central Asia at Bokhara?

As regards the coming months, the most serious possibility which had to be considered was whether the virulence of the Asian strain would increase from its present mild level, since the lethal waves of influenza in 1891 and 1918 were preceded in each case by milder epidemics.

THE DISEASE AS SEEN IN THE UNIT

A. Wrexham.

Captain K. W. Hickson, R.A.M.C., described an outbreak involving an Infantry Depot and a Royal Pioneer Corps Depot and Training Centre at Wrexham. The former unit was in barracks, while the latter occupied hutted accommodation mainly in Wrexham, but with a detachment at Gresford, six miles away.

The outbreak started during the week ending 31st August, all three camps being involved, though not quite in the same manner. At the R.P.C. camp in Wrexham the peak was reached in the second week, with another sharp rise during the fifth week : the total attack rate was about 40 per cent. The R.P.C. camp at Gresford had an attack rate of 20 per cent, with a peak incidence during the third week ; while at the Infantry Depot in Wrexham, where the attack rate was 30 per cent, the outbreak did not reach its peak until the fourth week. It was interesting to observe that the lowest attack rate occurred in a camp where newly joined recruits were fewest, the majority of troops being soldiers undergoing their third or fourth month of training.

The disease appeared simultaneously in different parts of the same camp rather than spreading from billet to billet. The morbidity rates were generally constant in all billets affected. Sleeping quarters were not overcrowded, though there was probably more overcrowding in the N.A.A.F.I. and Television rooms. Each camp had only one main dining hall where cross infection between different groups was possible.

The presenting signs and symptoms were varied. Pyrexia, headache, sore throat, cough and backache were common. Many had shivering and sweating, coryza, chest and limb pains. Vomiting, abdominal pains and stiff neck were noted occasionally. The majority of cases looked ill and dejected. The eyes were red and the skin flushed.

In most cases the temperature was between 99° and 102° F. In 10 per cent of cases it exceeded 103° F., while another 10 per cent were apyrexial throughout, though presenting all the other clinical features and running a similar course. A saddle-back temperature, with a secondary peak on the fourth day accompanied by an exacerbation of symptoms, was noted in 10 per cent of cases.

The mouth and throat were normal, but many showed redness of the pharynx and soft palate. The chest was clear in 98 per cent of cases. One early case had marked headache with neck stiffness and a positive Kernig's sign, and was investigated for meningitis; the cerebrospinal fluid was normal and he recovered with no specific treatment.

Bronchopneumonia occurred in about 1 per cent of cases, and responded to penicillin injections. Several cases had persistent cough and nasal catarrh lasting up to ten days. Other minor complications were epistaxis and gastric disturbance.

Cases were treated by aspirin, and kept in bed until apyrexial for twenty-four hours. Fluid intake was encouraged, and no restriction was placed on food so long as the patient wanted it. Minor complications were treated symptomatically.

All cases were isolated in specially adapted barrack rooms. Reporting sick was encouraged so that cases could be isolated as early as possible. In spite of this, however, a number of mild cases did not report sick and no doubt contributed to the spread of infection. Mixing of personnel between the three camps was reduced to a minimum. Strenuous activities were discouraged. Training was modified to reduce excessive fatigue on the assumption that fatigue would predispose to infection and to increased severity of the illness.

The chief difficulty in the management of the cases was the serving of hot food to the patients in barrack rooms. The problem was overcome by grouping all cases in billets which were conveniently near a cook-house, and which were provided with heating and sanitation. The unit detailed special personnel for duties involving cleaning of billets, bed-making and feeding of patients.

Fifty per cent of patients were discharged on the third day, and 25 per cent on the fourth day. After discharge they were put on light duties for two days, by the end of which time the majority were fit to continue training. Convalescence was more prolonged in those cases who developed a saddle-back temperature.

B. Oswestry.

Captain G. H. Carriett, R.A.M.C., described an outbreak in two Royal Artillery regiments at Oswestry. He confirmed the previous speaker's experience that cases appeared simultaneously in widely separated billets, with no evidence of direct spread from one billet to another. The outbreak, which was now showing signs of abating, started in mid-September, and so far the morbidity rate had been approximately 20 per cent.

Although the onset was sudden in a number of cases, there was usually a history of malaise lasting from a few hours to a few days before the men reported sick. The commonest signs and symptoms were pyrexia, headache, backache, pain in the limbs, sore throat, coryza and cough. One case developed severe unilateral epistaxis, and there was one case of otitis media without perforation. Follicular tonsillitis occurred in four cases. Nasal catarrh and cough had been common sequelæ. One severe case became delirious and cyanosed within eight hours of onset, although he had very few physical signs in the chest: he was transferred to a civil hospital, where he made a reasonably rapid recovery.

The majority of cases responded favourably to symptomatic treatment, and were fit to return to light duties within four days. Patients were given ordinary cook-house meals, but lemonade powder was issued to make an increased fluid intake more palatable. Feeding problems had again arisen mainly in connection with the service of hot meals to patients nursed in barrack rooms.

Preventive measures, which were published in Regimental Orders, covered such points as bed-spacing, the prohibition of dry sweeping and shaking of blankets in barrack rooms, the washing of cutlery and crockery, ventilation of barrack rooms, and the use of a handkerchief to cover the nose and mouth when coughing or sneezing. Men were advised to avoid cinemas, public houses, dance halls and all other crowded places in Oswestry, where there was a concomitant outbreak of influenza among the civilian population.

THE DISEASE AS SEEN IN HOSPITAL

Captain C. G. B. Downie, R.A.M.C., Junior Specialist in Medicine, Military Hospital, Chester, described the clinical features of 194 cases (all Indians) admitted from the Indian cruiser *I.N.S. Mysore*, berthed at Birkenhead.

The onset was sudden, and nearly all complained of generalised limb pains and hot and cold sweats. About 20 per cent complained of definite joint pains, mainly in the large joints, sometimes of such severity as to raise the suspicion of acute rheumatism. Within an hour or two of onset a dry, irritating cough developed with retrosternal pain. The initial temperature averaged 101° F., the highest recorded being 105.6° F. About 30 per cent of cases showed a saddle-back temperature curve, with a remission on the second day, a second peak on the third day and a fall to normal on the fourth or fifth day. A notable diagnostic feature was an unnatural brightness of the eyes, with the scleræ slightly pink and the conjunctivæ slightly swollen. Nasal catarrh was variable, but generally mucoid and rarely profuse. Labial herpes was noticed in some cases. The throat was slightly injected and granular in appearance, but there was no lymphatic gland enlargement. The more severe cases showed signs of meningismus during the first twenty-four hours.

Rest and aspirin were the mainstays of treatment, although some cases had to be taken off aspirin because of vomiting; this did not, however, seem to affect the course of the disease. Minor complications were treated symptomatically. Cases showing clinical signs suggestive of pneumonia were treated with two

mega units of penicillin daily, but only four cases showed radiological signs of consolidation. A purulent sputum was not considered an indication for treatment with antibiotics. White blood counts varied from less than 5,000 per cu. mm. in the uncomplicated case to 5,000-10,000 in those with purulent bronchitis, and over 10,000 in those with pneumonia.

GENERAL OBSERVATIONS ON CLINICAL FEATURES

Lieut.-Colonel F. B. Bagshaw, R.A.M.C., Officer in Charge, Medical Division, Military Hospital, Chester, referred to the rapidity of onset and the relatively high rate of infectivity as points in the differential diagnosis of influenza. He stressed, however, that the ultimate differentiation of the virus from that of other upper respiratory infections was dependent on laboratory confirmation.

In the past, various types of influenza had been described, depending largely on the severity of the infection and the complications which might occur. These were :

(a) *Pyrexial*. Mild cases with few, if any complicating features.

(b) *Malignant*. Fulminating infections with profound toxæmia, with the rapid development of the classical heliotrope hue and heart failure before there was time for local manifestations to appear. In such cases death might occur within twenty-four hours, and few would survive a week. It was this type which gave rise to the high mortality in the 1918 pandemic.

(c) *Pulmonary*. Some outbreaks might be characterised by the prevalence of respiratory complications. There was a progressive spread downwards of the catarrhal process with the production of bronchitis, bronchiolitis and alveolitis. The main feature was the development of pulmonary œdema with the production of copious amounts of pink frothy sputum. In these cases examination might reveal many crepitations with diminished air entry, but only rarely would there be any impairment of the percussion notes. Secondary infection might occur, with the production of pneumonia, pleurisy and empyema. In those cases which developed pulmonary œdema it was the œdema rather than any possible co-existent pneumonia which was the lethal factor.

(d) *Gastric*. Cases with gastro-intestinal symptoms rarely occurred in epidemic form.

(e) *Nervous*. Nervous symptoms occurred as sequelæ rather than during the active phase of infection.

The following are some of the common sequelæ of influenza :

(a) *Respiratory System*. Sinusitis and bronchitis. There may be recurrent lung infection due to permanent lung damage which may form the starting-point of a future bronchiectasis.

(b) *Cardiovascular*. Toxic myocarditis may delay convalescence.

(c) *Nervous Disorders*. Post-influenzal depression and headache are the most common nervous sequelæ and resemble those following dengue fever.

Attention was drawn to the importance of being on the look-out for co-existent disease during an influenza epidemic: in particular cerebrospinal fever, encephalitis, poliomyelitis and such conditions as infective hepatitis and glandular fever. It was also important to remember that all pneumonias were not necessarily influenzal.

Considerable publicity had been given recently to the production of influenza vaccine. It must be remembered that immunity from an attack of influenza is relatively short-lived, and effective only against a virus of the same type and strain.

LABORATORY DIAGNOSIS

Lieut.-Colonel T. G. A. L. Warrington, R.A.M.C., Assistant Director of Pathology, Western Command, said that nowadays the term influenza is restricted to an infection caused by one of the specific influenza viruses A, B and C or their sub-groups. If the diagnosis of influenza were to be made purely on clinical grounds it would be impossible to differentiate it from a host of non-bacterial upper respiratory conditions, referred to by Stuart-Harris as "the general scrap-heap of respiratory infections."

The role of the laboratory is twofold. On the one hand it helps the clinician to establish a diagnosis by the isolation and recognition of the specific virus concerned and to prescribe the appropriate treatment in cases where, unlike influenza, the virus is susceptible to antibiotics. On the other hand it helps the epidemiologist to trace the source and spread of the infection and enables him to decide on specific vaccine prophylaxis.

All laboratory procedures have two objectives in view :

1. The recovery of the virus during the acute stage from garglings or mouth washings, naso-pharyngeal swabs, and sputum (in cases of suspected pneumonia). After treatment with suitable bacteriostatic agents these specimens are injected into the amniotic cavity of a 13-day-old chick embryo, and four days later the amniotic and allantoic fluids are tested for the presence of virus.

2. The detection of specific antibodies in the patient's serum by means of :

- (a) Complement fixation tests (C.F.T.). This is the most suitable method for routine use.

- (b) Hæmagglutination inhibition test. This is based on the property of the influenza virus to agglutinate the red cells of fowls, guinea-pigs and human group "O" cells. This hæmagglutinating property (not specific to the influenza virus) is inhibited by specific antibodies when these are present in a patient's serum.

- (c) Neutralisation tests, determined by the ability of serum (containing antibodies) to protect against the effects of virus when serum and standard suspensions of virus are inoculated into an experimental animal.

Specimens are collected as follows :

- (a) For isolation of the virus : Pharyngeal washings or throat swabs are put into a buffered tissue culture medium, which is then kept at a temperature not

exceeding 4° C. and should be sent to the laboratory, in the frozen state.

(b) For the detection of antibodies : Between 5 and 10 ml. of blood are collected in a dry sterile bottle. The serum is separated within twenty-four hours. Tests are carried out on paired sera. One specimen is collected within the first four days and a second specimen between the tenth and fourteenth day of the illness.

At autopsy, the manifestation of influenzal infection on the respiratory tract is a manifold one and varies in its severity and distribution. The picture presented ranges from a simple catarrhal inflammation limited to the nasopharynx to cases where the whole respiratory tract is affected by an intense inflammatory œdema with hæmorrhages, fibrinous exudate and a variable degree of broncho-pneumonic consolidation. An outstanding feature is the implication of the terminal bronchioles which are the seat of a marked interstitial inflammation. The role of secondary bacterial invaders is evidenced by purulent secretion, areas of softening, suppurative foci in the lung, and septicæmia.

(Note : By the end of October, Asian-type influenza virus had been identified from outbreaks in Brecon, Long Marston, Preston and Rhyl, as well as in the Indian cruiser I.N.S. *Mysore*.)

DISCUSSION

The following points were made in discussion :

- (a) The periodicity of influenza epidemics.
- (b) An interesting feature noted in the present epidemic was that there had been little if any loss of appetite, even at the height of fever.
- (c) There is no known antibiotic effective against the influenza virus.
- (d) Seriously ill patients should not be moved distances over ten miles. If soldiers have to be moved for admission to a Medical Reception Station the extra journey of a few miles to the nearest hospital would not have any further deleterious effects.
- (e) The occurrence of silent pneumonia in influenza must always be borne in mind.

SUMMING UP

Major-General F. J. O'Meara, Deputy Director of Medical Services, Western Command, recalled that when working in the dissecting room between 1918 and 1920 the skin of several subjects was a heliotrope colour, which he had never forgotten. There was a very good description of that influenza outbreak, the "Spanish 'Flu" of 1918-20, in the official "History of the Great War" (1922).

The next time he encountered influenza was in the winter of 1932-33 in Catterick Camp, when many cases of meningococcal meningitis occurred at the same time. In France, in the grim winter of 1939-40, influenza was again prevalent, and this time was once more overshadowed by the high incidence of meningococcal infection. We were now confronted with this present outbreak

of Asian influenza. Thus in a working life spent among acute infectious disease, influenza had appeared approximately every ten years, namely 1918-20, 1932-33, 1939-40 and 1957-58.

General O'Meara indicated briefly the striking features of each outbreak.

The 1918-20 Outbreak. The main features were:

- (a) Heliotrope coloration of the skin. This occurred in all degrees, from slight cyanosis to vivid purple.
- (b) Acute suffocative bronchitis.
- (c) High temperature (104° F.) and paralysis of one ocular nerve (3rd, 4th, or 6th), which heralded the onset of encephalitis lethargica, was not infrequently seen.

The 1932-33 Outbreak. This was characterised by :

- (a) Acute suffocative bronchitis.
- (b) Heliotrope coloration.
- (c) Silent pneumonia.
- (d) Silent massive effusions, streptococcal in origin.
- (e) Staphylococcal pneumonia.

Some of the cases which on admission to hospital appeared to be influenza, subsequently proved to be *acute myocarditis* (now thought to have been due to Coxsackie virus, group B), *Bornholm disease* (also due to Coxsackie virus, group B), *encephalitis lethargica* or *meningococcal meningitis* (characterised by a posture of lying in flexion and by petechiæ).

The 1939-40 Outbreak. The complications seen in this epidemic were :

- (a) Pneumonia and
- (b) Empyema, both mainly pneumococcal in origin and
- (c) Meningococcal infection in every clinical form.

With regard to the present outbreak, he would not say what the coming winter held in store, but he thought the epidemic would be influenced by the mildness or severity of the weather.

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THE VAL-DE-GRÂCE, CHURCH, HOSPITAL, MUSEUM AND MEDICAL SCHOOL*

BY

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Late Royal Army Medical Corps

FROM the ninth century a Benedictine monastery had been located at Bièvres near the present French airfield at Villacoublay. In 1515, during the reign of Francis I, the monastery, in recognition of favours received, assumed the title of "Val-de-Grâce de Notre Dame de la Crèche."

In 1621, Anne of Austria, wife of the French King Louis XIII, seeing the old monastery at Bièvres falling into ruins, obtained the king's permission to transfer it to the then outskirts of Paris in the Faubourg St. Jacques. Here the original monastery comprised a small church, a chapter house, and a cloister. The French queen during her subsequent visits to the Val-de-Grâce vowed that if she were granted a son she would replace the small monastery church with a splendid new basilica. In 1638, after twenty-three years of married life, she gave birth to a son, Louis-Dieudonné, the future Louis XIV (Le Roi Soleil).

This unexpected birth of a son and heir caused great joy throughout the whole of France. In fulfilment of her vow, Anne of Austria, with the support of the Prime Minister Mazarin, commenced the construction of the beautiful new church. François Mansart, greatest of French architects, drew up the plans and commenced the construction. The architects Le Mercier and later Le Duc continued the work based on his designs.

The church, which was completed in 1666, is in the baroque style and is most famous for its dome, 131 feet high, which rivals those of the Sorbonne, Pantheon and the Invalides. Inside the church is the magnificent cupola with the celebrated fresco painted by Mignard, containing 200 figures, each three times life-size. Amongst the figures can be seen Anne of Austria and St. Louis.

Before the French Revolution it was the custom to bury the hearts of princes and princesses of the royal blood in the chapel of St. Anne, to the left of the high altar. Two queens, Anne of Austria and Henrietta, wife of Charles I of England, are buried here.

The chapel of St. Louis to the right of the high altar (now used by hospital in-patients) was formerly the nuns' choir which communicated with the convent cloister with its semi-circular arcades.

Hardly had this magnificent church been completed in 1666 when Anne of Austria, amidst great suffering, died of cancer of the breast.

From 1666 until the commencement of the French Revolution in 1789, the Abbey of Val-de-Grâce was visited by almost every royal visitor to Paris, includ-

* The Val-de-Grâce Hospital is concerned with post-graduate medical training only. *Under-graduate* training of the potential French Army medical officer is carried out at L'Ecole du Service de Santé Militaire, described elsewhere in this issue.—ED.

ing Queen Henrietta Maria of England, Charles II, James II, and the Austrian Empress Maria-Theresa. By 1790 twenty-three nuns resided at the Val-de-Grâce.

But in 1793, following a decree of the Revolutionary Convention, the monastery was suppressed, and the buildings converted into a military hospital. Both the church and monastery were severely damaged and mutilated. The chapter hall was converted into the hospital kitchen, but considerable difficulty was experienced in converting the monastery as a whole into a general military hospital. In 1795 the Military Hospital of Val-de-Grâce was officially opened, and recognised in 1796 as a teaching hospital, on a par with the military hospitals of Lille, Metz, Strasbourg and Toulon. This role continues today. The church after the desecration of 1793 was used as an anatomy theatre and a military medical store until 1826, when it was restored to its proper mission.

In 1836 the hospital commenced to provide facilities for post-graduate studies; in 1850, by a decree of the 9th August, the hospital was officially designated as the "École d'Application du Service de Santé," the equivalent of the Royal Army Medical College, and The Queen Alexandra Military Hospital, Millbank, and the Walter Reed Army Medical Centre, Washington, D.C.

Between 1836 and 1856, new hospital buildings were added in the monastery gardens, and some of the damage caused during the Revolution was repaired. Hardly had these restorations been completed when in 1870, during the Franco-Prussian War, over 300 shells fell on the hospital, causing casualties amongst the patients. During the insurrection of the Commune in 1871, the hospital was again bombarded.

The former nuns' refectory and buildings surrounding the cloisters now form the Musée du Service de Santé. As early as 1850, the year of the commencement of the medical school, a collection of anatomical specimens was in existence, containing specimens provided by such famous military surgeons as Larrey, Begin, and Sedillot; also a collection of souvenirs, relics, tableaux, busts, and portraits covering the whole previous history of the French Army Medical Services. But it was by the influence of Justin Godart, Under-Secretary of State, that the museum attained its present superb achievements. Today the Val-de-Grâce Military Medical Museum, with its spacious halls and galleries, contains the finest available collection of documents, archives, models, relics, and souvenirs of military medicine. Being located near the hospital and medical school, it provides unique sources of information for students of the medical aspects of warfare.

The Central Library. This at present includes over 110,000 volumes relating to military medical studies. It also houses an imposing collection of military medical journals, French and foreign, ancient and modern. Amongst these it is interesting to note that the *Journal de médecine militaire* commenced in 1766.

The Archives. These are housed in portions of the vaulted kitchens of the former monastery and are divided into two portions. The first portion comprises archives of great historical interest relating to the French Army Medical Services during the period 1781 to 1914. Amongst those may be seen the first commission

granted to the great military surgeon, Larrey, in 1792; also a letter from Frederick William of Prussia, dated 1803, congratulating Larrey upon his successes during the Egyptian campaign. The second portion of the archives covers the period 1914-1918. This unique collection includes monographs, reports, photographs, diagrams and films covering all aspects of the French, allied and enemy armies, both in Europe and the middle and far eastern theatres of war.

The Anatomical Section. This is located in two vaulted halls which formerly, before the Revolution, served as the monastery refectory. There are over 6,000 specimens (wax and plaster models, anatomical specimens dried and mounted, fragments of projectiles, etc.). These specimens have been collected during the Revolutionary wars, as well as the wars in the Crimea, Italy, Mexico, and in 1870, 1914-1918, and 1939-1945. This unique museum of military surgery has special sections devoted to wounds of the skull, the orbits, and maxillo-facial injuries, neurological lesions resulting from war injuries, and finally injuries of the limbs and trunk. One portion of this section is devoted to projectiles of all sorts removed from war-wounds.

The Field Medical Section. This portion of the museum, installed on the first floor overlooking the gardens of the cloister, contains a unique collection of equipment relating to almost every activity of the medical services in the field. Firstly, one can examine every kind of weapon used by belligerents, and the various protective measures devised to counteract them, *e.g.*, steel-helmets, body-armour, respirators, etc. There follows a series of specimens showing the efficiency or otherwise of these protective devices. Secondly, there is a superb demonstration of every form of transport used in evacuating casualties from front to rear, by road, rail, water and air. In this connection the French army were the pioneers in transporting casualties by air. Apart from over 160 cases flown out from the siege of Paris by balloon in 1870, the credit of being the first to transport a wounded man by air belongs to a French pilot, Captain Dancelzer, who flew a wounded Serbian airman to safety during the retreat of the Serbian army in 1915. The French army was also the first to introduce air ambulances, in Morocco in 1918. The museum includes models of these and other aircraft. This section also includes models showing every kind of shelter, aid-post, collecting centre and hospital used in the various campaigns.

The therapeutic section demonstrates the different methods of therapy used in the practice of military surgery in the field. It was during the Franco-Prussian War of 1870 that Ollier recommended the combination of free drainage, absorbent dressings infrequently changed and immobilization in plaster of Paris. Included in this section also is the apparatus used by Carrel in the First World War for the intermittent irrigation of war-wounds with hypochlorite solutions; also a unique collection of splints of every kind, fracture apparatus, and prostheses for amputations. A collection of over 20,000 films and photographs of different kinds of apparatus used portrays the development of diagnostic radiology in the field.

The preventive medicine section demonstrates the struggles against malaria, typhoid, tuberculosis, dysenteries and other infections, and includes experiences gained in Korea and Indo-China. A fascinating exhibit in this section is the work of a young French army medical officer, Ernest Duchesne, who in 1897, at the age of 23, first discovered the antibiotic action of penicillin, forty-three years before the discoveries by Fleming, Florey and Chain. Working under the guidance of the celebrated Professor Roux at Lyons, Duchesne on 17th December, 1897, submitted his thesis on *Contribution à l'Etude de l'Antagonisme entre les Moisissures et les Microbes*. This thesis clearly demonstrated the prophylactic and therapeutic possibilities of penicillin.

The Historical Section. This is accommodated on the first floor of the monastic building, in large halls adjacent to the chapel, forming part of the original choir. These historic galleries recall to memory the great French military surgeons and physicians of the past such as Larrey, Percy, Desgenettes, Villemin, Laveran, and Vincent. The whole panorama of French military medicine from the Renaissance to the present day is covered with a magnificent display of paintings, drawings, documents, old instruments and books. Mingled with this collection are a number of scenes on the French front during the First World War. This section is approached by a Louis XIII staircase.

On the staircase, which formerly led to the monastery infirmary, are exhibited a series of eleven plastic models portraying different hazards which casualties may encounter between the point where they are first picked up, and the aid post where triage is first carried out. A striking canvas with life-size figures shows Napoleon III, after the battle of Montebello, being shown wounded by Hippolyte Larrey, son of the great Larrey. Another canvas shows Ambroise Paré, the father of military surgery, at the siege of Metz in 1552. Paré took part in no fewer than forty campaigns. (During a siege of Boulogne by the English army, he describes having to duck his head to avoid a cannon-ball!). Ambroise Paré replaced the cautery with ligatures for hæmostasis in amputations; invented artery forceps; described in detail treatment of fractures and made great advances in nursing techniques. For the treatment of gunshot wounds he substituted cooling soothing balms instead of scalding hot oil as had been the custom. When praised for his treatment of gunshot wounds he modestly stated: "Je le pensait; Dieu le guérit."

The historical section also contains numerous souvenirs of Jean Dominique Larrey, Napoleon's great Surgeon-in-Chief, who served the French armies continuously from 1792 to 1842, from the Revolutionary Directory to King Louis-Philippe. Larrey took part in the siege of Toulon, and in the campaigns of Spain, Italy, Egypt, Russia, Germany, and France itself in 1814. He was present at the battles of the Pyramids, Aboukir, Jaffa, Acre, Austerlitz, Jena, Essling (where he performed a successful thigh amputation on Marshal Lannes in two minutes), Wagram (where he was made a baron), Borodino (where, after performing 250 amputations, he accomplished prodigious feats with the care of the wounded); Lutzen (where he attended to over 2,000 wounded), and finally

Waterloo, where, whilst Surgeon-in-Chief to the Imperial Guards, he narrowly escaped being shot by the Prussians and was saved only by the intervention of Blücher himself. Whilst in St. Helena, Napoleon described Larrey as "l'homme le plus vertueux que j'aie connu." The portion of the historical section devoted to Alphonse Laveran is of particular interest to visitors from Great Britain.

In 1880, whilst serving in the military hospital at Constantine in Algeria, Laveran, examining unstained blood films of a soldier under treatment for fever, noticed highly motile flagellated elements attached to pigmented spherical bodies, and moving with such vigour as to displace neighbouring blood corpuscles. Laveran's original "Description d'un nouveau parasite trouvé dans le sang des malades atteints de fièvre palustre" (Paris, 1884) was initially received with great scepticism. It was not until 1889 that, Laveran's parasites having been found in the blood of malarial patients in numerous other parts of the world, his researches were proved beyond doubt. Laveran, who subsequently continued his researches on pathogenic protozoa, was awarded the Nobel Prize in 1907. Included in the letters of congratulations to Laveran is one in original, dated 11th December, 1907, addressed by General Sir David Bruce, from the Royal Army Medical College, London.

The historical section contains numerous other fascinating souvenirs, such as those appertaining to Médecin Général Inspecteur H. Vincent who, in 1892, first discovered the fusiform spirilla of ulcero-membranous angina and also discovered *Streptothrix maduræ*, the cause of Madura foot. He also carried out numerous researches in prophylactic immunisation against the typhoid group of fevers.

The Val-de-Grâce Hospital, which at present comprises 1,000 beds, has since the Second World War commenced a long-term programme of modernisation. New diagnostic and therapeutic radiological departments, surgical wards and a new neuro-surgical department have been built.

It is intended to erect a 2,000-bedded military hospital on the most modern lines within the grounds of the former royal abbey of Notre Dame de Val-de-Grâce. The intention is that this historic monument, the cradle of French military medicine, with its church, hospital, medical school and museum, shall continue its mission of training medical officers of all three services with the most advanced facilities available.

When we recall the superb contributions made to military medicine by Larrey, Percy, Desgenettes, Villemin, Laveran and Vincent, we can but wish to Val-de-Grâce, "*Ad Multos Annos.*"

The writer wishes to thank Médecin Général Inspecteur R. L. Debenedetti and Médecin Général Inspecteur J. L. Pesme for their kindness in arranging visits to the Val-de-Grâce, and Médecin Colonel J. A. Ory and Médecin Colonel J. J. Hassenforder for advice and assistance in writing this paper.



Fig. 1.

The Curator of the museum showing the Director-General the skull of a French soldier wounded at the battle of Waterloo, with the bullet embedded in the parietal bone.



Fig. 2.

Médecin Colonel Hassenforder, Curator of the Museum of the Val-de-Grâce, showing Lieut.-General Sir Alexander Drummond the original letter sent by Sir David Bruce to Alphonse Laveran.

OFFICER TRAINING IN THE FRENCH MEDICAL SERVICES

L'ÉCOLE DU SERVICE DE SANTÉ

BY

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ON the 12th May, 1956, at Strasbourg, a ceremony was held to celebrate the first centenary of the French army's own medical school. It moved from there to Lyon in 1870 and its badge is now the coats of arms of both cities with the international "rod and serpent" and the insignia of the Legion of Honour. L'École du Service de Santé Militaire is at one and the same time an officers' training establishment, a military academy and a teaching hospital.

Briefly, one should explain that the Service de Santé incorporates medicine, veterinary services, public health, dentistry, pharmacy and all branches of administration required by the medical services. Each branch has, of course, its own terms of service, and officers are identifiable by uniform facings.

Competitive entrance examinations are held annually. For the medical school the examination is open to all, of either sex, who are qualified for registration as medical students and are between the ages of 17 and 25 years or, if already registered, have completed their first or second year. Other branches are similarly recruited. For the administrative section particularly, young regular non-commissioned officers of proved ability are encouraged to compete, and a large proportion of vacancies are reserved for them. With nearly a million men under arms, they appear to find little difficulty in obtaining suitable material. About three times the required number come forward each time. Competition is very keen. Selection boards sit both before and after the written examination.

In the medical school alone there will be sixty vacancies this year* for the Metropolitan Army and Air Force. A similar establishment at Bordeaux offers a further fifty-one required by the Navy and Colonial Armies. Thus one hundred and eleven students will embark upon a free medical education under this scheme.

The school proper is located in a barracks in the centre of Lyon. Originally built on four sides of a square parade ground, the block to the north was destroyed during the war. It has all the amenities that one could expect.

Until recently the teaching hospital was also in the city centre. It is now to be found about three miles to the east in the suburb of Vinatier. It is almost next door to the Faculty of Medicine and close to the civilian nursing college, a sanatorium and various other medical establishments. Across the road from

* Written in 1956.

the hospital more land has been acquired on which it is hoped to provide new accommodation for the remainder of the school.

The school and hospital are commanded by a médecin général. He has as assistant, a médecin colonel whose main function apart from that of deputy is medical superintendent of the hospital. The medical students travel back and forth in the school buses. Student officers of the administrative cadre live and work in the school, while the reservists have a barracks of their own on the other side of Lyon. Students in other branches, except pharmacy, and all females are entered as external students of the school and arrangements are made for their training by civilian faculties.

The hospital's full title is L'Hôpital Militaire d'Instruction Des Genettes, named after the famous medical general of Napoleon. Two fine murals adorn the entrance hall. One, a portrait, is inscribed "Des Genettes fait prisonnier par les Russes, Libéré grâce à sa réputation." The other shows him inoculating himself in front of his patients and bears the caption "Des Genettes s'inoculant la peste à Jaffa le 4 Aout, 1799." He was said to have inoculated himself first in order to inspire confidence among the sick.

This hospital first began to function in 1946-47. The latest addition, completed only a few months ago, is the laboratory block. The main building is H-shaped, 135 metres long and five storeys high. The laboratory block has three storeys, and is of similar shape. The isolation block, two storeys, is in the shape of a crescent-headed arrow. Yet another block was designed as a maternity wing, but this failed through lack of support and now provides living accommodation for the nurses. There are no commissioned ranks in this branch. Other buildings include three married quarters for officers, a chapel and mortuary, garages and so forth.

All buildings are intercommunicating by means of cellar corridors. Central heating is installed throughout. A fascinating device was the method selected for delivery of hot meals to wards which is reminiscent of the gadget in the draper's shop, in which he slipped your money and the bill before pulling a cord causing it to shoot across to the cashier in the far corner. The kitchen is in the cellar. Beneath the floor run horizontal lift shafts. Driven by electricity, containers shoot along these shafts until they arrive at the desired building or wing and then mount to the correct floor. A similar device delivered drugs from the pharmacy. I was sorry not to see the system functioning. They now use electrically heated food trolleys which are most effective. Of course, in this hospital they have no occasion to go outside. The trolley goes from block to block through subterranean passages.

Every department of the hospital has obviously been designed to facilitate both teaching and research. The octagonal theatres are beautifully neat and provided with a gallery for students who, on the average, would not be more than seven to eight feet from the operating table. The surgeon has a microphone which enables him to talk both to the students and his preparation room staff. Provision for air purification and cinema equipment has also been made.

The radiography and physiotherapy departments are extremely well equipped.

Machines, some electronic, are of varying types and vintage and include one or two developed during the last three to five years. Cancer patients were being treated at the time of our visit and the staff were very proud of their equipment, premises and results achieved.

The ear, nose and throat department has soundproof chambers which are really soundproof. The "Stomatologie" department, with all its grim reminders of the horrors of war, appears to be a development of our maxillo-facial units, in which the specialist in dental surgery co-ordinates the operation in all cases of facial injury, bearing in mind that if the jaw is damaged the eye and ear may also be involved.

The laboratories are a sheer delight. Being in the hands of pharmacist officers, they have every branch but pathology. Each department has its own wing and the head of each his own personal laboratory. The main classroom is spacious. The benches have places for about sixty students, each with water, gas, microscope and accessories. An annexe to this is the projection room where an American "Scopicon" micro-projector throws the picture on to a large screen.

The pharmacists cover a varied field. They claim to produce 95 per cent of the drugs used by their Services. They run the medical stores, where only drugs are stocked. Items of our P.L.M.E. Sections 2-10 are dealt with in General Stores of the Service de Santé together with what we would call Ordnance and, in some cases, Engineer equipment. Naturally, they have a large analytical department and run their own school of pharmacy. The chief pharmacist at Des Genettes is a lieutenant-colonel. This branch also has its generals.

The administrative officer, as has been seen, is trained while young. The regular officer has a two-year course. He is encouraged subsequently to continue his studies until he obtains a degree in economics, law or the arts; great emphasis is placed on tradition and custom, the first year being almost entirely devoted to the growth of the army and the Service de Santé. He studies the laws from which the army derives its revenue, its power and its rights; the manner in which these are delegated and shared by the various arms of the service. He visits civilian establishments and also studies their internal economy. He is thus well equipped for his second year when he starts practical work in a hospital.

The Des Genettes is a 750-bed hospital which is designed to expand to 1,000 or more. I found non-medical officers working in reception, Q.M. stores, the catering department, cost accounting and so forth, all serving under their own chief, the gestionnaire. This gentleman, the greybeard of the administrative officers, has a function equivalent to that of his counterpart in one of our smaller hospitals where there is no quartermaster. Everything passes through his office and he is finally responsible for all the others. He has financial power and responsibility. His subordinates are responsible to him and he for them.

British quartermasters are usually jealous of their right of access to the commanding officer. These youngsters with their lack of years or experience are grateful for the protection and guiding hand of their gestionnaire. I felt that he needed broad shoulders, because he was responsible for everything, administra-

tion, organisation, equipment, stores and accounts. In busy periods his signature could be little more than a rubber stamp. On the other hand, it must be admitted that courts of inquiry are almost unknown and losses are rare. This was my experience everywhere I went in the French army. It may not be a true picture, but I could find no evidence to the contrary.

As practically every male of military age is a soldier, either active or reserve, the doctor gets patients of all ages. It is not suggested that all hospitals are equipped and staffed on the same scale. Des Genettes is a teaching hospital and consequently has a greater claim. Post-graduate training and the award of higher qualifications take place in Paris at the Val-de-Grâce Military Hospital, where the professorial chairs are held.

My sincere appreciation is due to M. le Médecin Général Daniel Giraud, Agrégé du Val-De-Grace, Directeur, Ecole du Service de Santé Militaire and Des Genettes, and all ranks of the Service de Santé, for their courtesy, hospitality and co-operation.

Book Review

PULMONARY COMPLICATIONS OF ABDOMINAL SURGERY. By Anthony R. Anscombe, M.S. (Lond.), F.R.C.S. London : Lloyd-Luke (Medical Books) Ltd. 1957. Pp. 121 + x. Illustrated. 20s.

In this monograph the author presents a lucid clinical and experimental study of the factors concerned in the pulmonary complications of abdominal surgery. The material is well set out and the author has avoided any tendency to dwell at length on any particular aspect, thus making the book easy reading for the busy surgeon or anæsthetist. Nevertheless some subjects get more thorough attention than others.

The author emphasises the importance of the pre-operative estimation of pulmonary mechanical efficiency and describes a simple method of doing this. The importance of gentleness in operative manipulations is rightly stressed and it is interesting to be reminded that the site of the incision is of more importance than the type of operation, and the type of anæsthesia is of less importance than the experience of the anæsthetist.

Surgeons, anæsthetists and physicians will find this attractively produced monograph both stimulating and interesting.

J. M. M., R. W.

Erratum

In the article "Some Aspects, Mainly Medical, of the Gurkha Recruiting Season, 1955," by Major W. S. Millar, R.A.M.C., in the July, 1957 number, page 151: 15th line from the foot of the page: for "5.5" read "1.5."

COMMON STRESSES IN A MILITARY ENVIRONMENT

BY

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A SIMILARITY of pattern, emerging from a number of cases from military married families, seen as psychiatric out-patients, suggests the existence of specific stresses acting in these circumstances. Although they present for medical treatment, it seems likely that such cases are the product of social forces. Without attention to the social background, it is doubtful if any therapeutic measures will achieve much success.

MARRIED QUARTERS

Sociologically, military married quarters present many remarkable if not unique features. Most prominent is the uniformity of occupation. This can be approached, in this country, only by some mining communities, although few can reach the figure of 100 per cent in the predominant occupation. However, whilst tending to a certain mental inbreeding, it is doubtful whether this factor is of great significance from the psychopathological point of view.

Situation is more important. The larger groups of married quarters, attached to the main military centres, are, in many cases, distant from the amenities of a large town. Some quarters are separated even from a village shopping centre. This presents not merely the physical problem of transport for a wife with young children, but a definite psychological strain in women brought up in a highly urban environment. The loss of easy access to large shops, entertainments and other institutions, as well as the comparative sparseness of population, may provoke an acute sense of isolation increased by separation from relatives and friends. The same feature is sometimes seen, though to a lesser extent, in young soldiers nurtured in large towns, who are posted to small, scattered units. Here, however, the feeling of isolation is usually diminished by the close comradeship of the barrack room. This sense of isolation, like some other features of married quarters, is also seen in some of the newer housing estates, although few of these are so remote from a large centre as many military sites.

As well as occupation, the age distribution of the inhabitants of military quarters is unusual. Old people are rare, and few adults are past early middle age. The number of young children is very large since, as in the case of civilian housing, they carry the strongest priority value. Inasmuch as the absence of old people means separation from parents and other older relatives, it is clearly significant, depriving the young married women of a traditional source of support. This "separation from Mum" has recently been referred to in a sociological survey of a L.C.C. housing scheme (Young & Willmott, 1957). Recent rehousing has, in the case of most large towns, disrupted the previous pattern, in which

married children normally settled near to parents, usually the wife's, and maintained an intimate contact during the early years of marriage. In the case of military families, the distances of separation are usually much greater, and the loss of contact, therefore, more pronounced.

A further and more significant aspect of this same question is the geographical mixture that service families represent. Amongst civilian working-class families a change of region is unusual and mobility is discouraged by the fact that several years' residence is usually necessary to qualify for a council house. In the older districts, family groups tend to be stable and marriage is usually to a local person. In these social groups, unlike those of the higher incomes, regional origin is immediately obvious in the accent.

Service married quarters, however, represent a complete contrast. Both men and their wives are an artificial agglomeration drawn not only from every part of the British Isles but also from many areas overseas. In these circumstances there is clearly no sense of regional identity to provide a cohesive social force. Residence in any one place is always temporary, a matter of a few years, and not infrequently felt to be uncongenial. Not only is each family likely to be strange to the district, but all the families around may be equally strange, though each in their different way. The only real exception to this would be in the case of county regimental depots.

Whilst geographical identity is absent, and family ties generally broken, a substitute may exist in the military unit as a social entity, embracing both men and families. The extent to which this compensation is possible varies, not only with the character of the unit, but also with that of the individual soldier, and whether he seeks his social life there. In the case of isolated stations, there may, of course, be little alternative, but this is an important factor in the maintenance of unit morale.

This leads to what is felt to be the most acute psychiatric problem—that of the wife whose husband is overseas with his unit, and may have been so for a long period. Not only are the marriage partners separated, but contact has been lost with the only significant social entity available—the military unit. It is these wives, separated from husband, family and background, usually responsible for several young children and often living in an isolated area, who present the syndrome described below.

CLINICAL FEATURES

Most commonly, these patients present with severe anxiety symptoms, although depressive features may be present. Poor appetite, insomnia, inability to concentrate and irritability are usual; phobic features may be present. In general, those who present as psychiatric problems are of poor intellectual endowment, and many show a general inadequacy. Since they have usually had to cope single-handed with young children for a long period, they not unnaturally complain of absence of energy and chronic fatigue. This tends to be exacerbated by the poor diet which is usual, and by frequent pregnancies. Many are, no doubt, cut off from their traditional food supply—the fish and chip shop.

They commonly complain that they have very few, if any, friends in the area. Whilst this may sometimes represent an individual failing, its regularity suggests the importance of the social factors referred to above. Not only are normal social and family groups absent, but the woman, tied down by young children, has simply no opportunity to attend any outside functions. More than one patient has stated that, except for a weekly shopping expedition, usually fatiguing, she has not been out of her quarter for months. In the evenings, by the time her children are in bed, she is exhausted and has little to do but brood on her loneliness.

The poor intelligence of many such patients makes it difficult for them to plan financially, in the absence of their husbands and relatives. They may readily accumulate debts or hire-purchase difficulties, which may be accentuated if they have taken to smoking or even drinking, as a relief from anxiety. The further anxieties of financial struggle are likely to exacerbate any symptoms already present.

Psychiatric symptoms, allied with physical fatigue and social isolation, make it increasingly difficult for such women to continue managing their affairs. Neighbours, particularly those whose husbands are at home, may help with acute problems, but nevertheless the woman tends to feel that she is fighting a losing battle on her own. In these circumstances she may consult her medical officer or some other organisation, in an attempt to have her husband recalled. Such a return is seen as the only way out of the situation. If the woman should require admission to hospital for any reason, and if there are no relatives or friends able to take the children, this may in fact be necessary, although clearly it is a measure to be employed only in the last resort.

Medical officers to families bear the initial brunt of these problems. The women may complain to them of some purely physical ailment, but a brief conversation will usually reveal the background of loneliness and struggle. Clearly, a dismissal with sedatives would be unfortunate, and a patient is likely to return soon in such a case. Milder cases may respond to a sympathetic interview, in which perhaps advice can be given on some specific problems. The more moderate degrees of tension existing in such cases, may justifiably be treated by a short period of sedation, whilst factors such as diet or menstrual disturbances are taken into account.

Where anxiety or depression are more marked, the case is likely to be referred to a psychiatrist, and hospital admission may be indicated. Two cases seen recently each gave a history of a previous psychiatric breakdown, from which a good recovery had been made. In each, relapse had been precipitated by a long period of marital separation, associated with absence of social contacts. If, however, the condition is not so acute, the patient may be given an opportunity to ventilate her difficulties, and symptomatic treatment with sedatives or tranquilisers attempted. During the Suez Crisis, when many husbands were overseas without their families, some success was obtained with the newer tranquillisers, particularly where night fears were preponderant. Nevertheless, such a régime is generally disappointing in its results, and it is felt that more success would be

obtained if practical help could be offered to the household and if some form of social re-integration were possible.

In the case of financial difficulties, what is usually required is not extra money, but some firm guidance in the use of the patient's allowance, with regular deductions for debts. Where, through fatigue or fecklessness, the woman has become incapable of keeping her home and family cared for, something in the nature of the Family Service Units, which operate on a voluntary basis in some cities, would undoubtedly be the answer. In the absence of such units, Local Authority health visitors or home helps may be valuable in specific cases, but the situation of many quarters is difficult for these services. Voluntary organisations, particularly the Soldiers', Sailors' and Airmen's Families Association have an important part to play, but some have a tendency to act by a combination of exhortation and charity, neither of which are really appropriate. None of the patients seen recently by the author has had any active religious affiliations; nevertheless, it is felt that visiting by garrison chaplains and associated religious bodies might be helpful in many cases.

CONCLUSION

Fundamentally, the problem stems from the conditions of service life, so that the most important preventive measure is the existence of adequate, modern quarters in every families' station, which would reduce periods of separation to the minimum. Within married quarters, there is a great need for some form of social organisation, which might help to bring together the many fragments, torn out of their geographical and kinship contexts, which military families represent. This problem exists also to a marked degree in new towns and large housing estates, and it appears that no real solution has yet been found. However, these civilian populations are not subject to the constant movement which is characteristic of service families. Finally, practical help is required for those women who, through poor endowment, psychiatric illness, or overwhelming force of circumstances, are unable to meet their domestic difficulties.

SUMMARY

A number of recent cases have thrown light on the problems of some wives in military married families' quarters, particularly when separated from their husbands.

These are discussed in the light of certain sociological features, which are believed to be peculiar to these situations. The difficulties of treatment on a medical basis are referred to, and the desirability of more practical help and of social re-integration is suggested.

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ARMY CONCEPTS OF FORWARD AEROMEDICAL EVACUATION

BASED ON A PAPER BY

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GENERAL MAXWELL D. TAYLOR, of the United States Army has said : "I often feel that there is considerable misunderstanding about Army aviation and its objectives. It is in nowise competitive with the roles and the missions of the Air Force. It rather attempts to obtain for the units of the Army mobility based upon the low-performance fixed-wing airplane and the transport helicopter. These vehicles do for us in the air what trucks do for us on the ground. They are not formed into an Air Force or an Air Corps, but rather are scattered through seven of our combat arms and services. For example, the Artillery, the Infantry, the Transportation Corps, and the Army Medical Service all have their need for this type of air transportability to adjust fire, to expedite reconnaissance, to move supplies and to evacuate the wounded. Particularly on an atomic battlefield, which as we visualise it will be characterised by great dispersion of units, we will need air transportability for many vital components of the Army system of weapons and equipment."

As a corollary to that statement it may be said at the beginning that Army aeromedical evacuation is not intended to replace or duplicate support provided by the Air Force to the rear of the combat zone. It is an extension into the forward areas of the proved value of aerial evacuation, where early treatment and selective evacuation are paramount. A better understanding of the organisation and role of Army forward aeromedical evacuation and its link with Air Force supporting aeromedical evacuation will be obtained if the Army policy is expressed.

Forward aeromedical evacuation includes the air evacuation of patients from place of injury to place of initial treatment and then on to medical units located in the combat zone. Supporting aeromedical evacuation is the movement of patients by air from medical units located within the Army area to outside the combat zone. The requirements of these two types of aeromedical evacuation differ in several important respects, therefore different procedures must be adopted.

The Army has long recognised the advantages of aeromedical evacuation, but until recently has not had the proper aircraft in sufficient numbers for this to be carried out in the forward areas. As early as 1936 field trials of the autogyro as a forward evacuation vehicle were conducted. The idea was discarded at that time due to engineering and financial reasons only.

The feasibility and full advantages of aeromedical evacuation by high-

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performance fixed-wing aircraft became apparent early in the Second World War. Then air evacuation was designed as the primary means of moving patients to the rear of the combat zone. This was carried out by transport aircraft of the Air Force. Pending development of the helicopter and the assault type aircraft there remained, however, little chance of progress in forward aeromedical evacuation.

In Korea circumstances demanded that the advantages of air evacuation be extended into the most forward areas. The restriction and disposition of Army treatment facilities, the nature of the country, the type of fighting, and the extremely limited surface communications, all combined to establish an urgent requirement for a rapid, atraumatic, certain way of evacuating casualties from forward medical units to hospitals capable of providing definitive, life-saving surgery. These considerations, plus the acceptance of the helicopter as an organic vehicle of the Army, allowed the final fulfilment of an old ideal of the Army Medical Service.

The development of forward Army aeromedical evacuation in Korea was the result of expediency rather than a preconceived plan. Shortly after the outbreak of fighting, a helicopter detachment of the Third Air Rescue Squadron began to receive requests from units for the evacuation of casualties from difficult country. As this detachment was not fully occupied in its primary role, these calls were answered. By August, 1950, this unit was answering so many calls that it spent most of its time on medical evacuation.

Quick to note the advantages of helicopter evacuation under such conditions, and after certain tests were carried out, the Army adopted helicopters for the evacuation of casualties. In January, 1951, the first Army helicopter detachment with a primary role of medical evacuation became operational. This was soon followed by two other units.

These units were originally non-medical and were attached to forward surgical hospitals; under the operational control of D.D.M.S. Corps. In August, 1952, the helicopter ambulance unit was authorised as a medical unit and became operational in December, 1952. The record achieved by medical helicopter ambulance units in Korea is now history and is one of the major factors contributing to the reduction of mortality among wounded to only 2.4 per cent, the lowest in any major war to date.

POLICY

Army Aviation is capable and accepts the task of forward aeromedical evacuation. The existing agreement between the Army and the Air Force is that the Army may have such fixed-wing aircraft (within certain weight limits) as it requires to perform its duties, and rotary wing aircraft (without specific weight limitations) as it requires for its tactical and support role within the combat zone.

One of the roles of army aircraft is aeromedical evacuation within the combat zone which includes battlefield pick-up and movement of casualties to the initial place of treatment and subsequently to medical units within the combat zone.

In order to be effective, forward aeromedical evacuation must be immediately available. It must be completely integrated with other tactical and administrative operations and must be compatible with existing operational and medical situations. Severely wounded men cannot afford to wait for time-consuming interservice arrangements for their evacuation. To do so would nullify many of the advantages of forward aeromedical evacuation.

Within the Army, the Medical Service has the responsibility for medical evacuation, whether by land or by air, and it is the only organisation within the Army with experience in the movement of casualties. Any division of the responsibility for medical evacuation within the combat zone would result in confusion, duplication of effort, and a marked reduction in effective medical care. Efficient evacuation is an adjunct to effective treatment. Correct integration of evacuation with treatment is essential for economical medical care. The D.M.S. is responsible for the policy, procedure and technique in aeromedical evacuation within limits laid down by the Staff.

AIRCRAFT

The Army Medical Service has authorised helicopter ambulance detachments to carry out emergency evacuation. These units consist of five helicopters, seven pilots, and the necessary other ranks. Until recently all units were equipped with reconnaissance type helicopters capable of carrying two stretcher patients in pairs. Certain medical ambulance units have now been issued with the Sikorsky H-19 helicopter capable of carrying six stretcher patients inside. The latter are interim equipment.

The aircraft of choice for forward aeromedical evacuation is a high performance, small silhouette helicopter capable of lifting two stretcher patients and one medical orderly inside. The Bell XH-40 helicopter, which will be available in 1960, is ideal. The exclusive use of reconnaissance helicopters as interim equipment for all medical helicopter ambulance units is not desirable. Pending the issue of a suitable helicopter (such as the Bell XH-40), the use of a variety of the helicopters now available will reduce the limitations of each type of aircraft.

Medical helicopter ambulance units are for the movement of severely wounded casualties where promptness of treatment will determine the difference between death or survival, or the loss or retention of a limb. These individuals must be picked up as quickly as possible and taken directly to medical units capable of giving the type of medical care that is required. These patients normally require detailed medical surveillance during the flight, and the aircraft normally crosses at least one tactical boundary. The allotment of single-purpose ambulance aircraft is considered to be no more uneconomical than the provision of fire engines and field ambulances by the Army. In fact the efficiency of air operations is increased in that their tactical commanders are not constantly required to divert aircraft from other roles for aeromedical evacuation beyond their own boundaries.

DEPLOYMENT

Normally helicopter ambulance units are allotted to Army and attached to forward medical units under the despatch control of D.D.M.S. Corps or commander of Corps Medical Centre. This allotment forward increases flexibility in that units may easily be moved from one sector to another, and attachment to subordinate medical headquarters facilitates administration and the co-ordination of air and ground evacuation. Also, location at supporting medical units is appropriate in that these units are normally the rear terminus for emergency aeromedical evacuation. The D.D.M.S. Corps or O.C. Corps Medical Centre is close enough to the front to know the situation, yet far enough away to be able to balance priorities for evacuation and to know the situation in the supporting medical installations.

In special situations—*i.e.*, river crossings, airborne assaults or amphibious operations—helicopter ambulance units may be attached to Divisions. In such cases the A.D.M.S. will exercise normal operational control.

NON-EMERGENCY EVACUATIONS

The routine air evacuation of non-emergency patients can most economically be accomplished by returning transport aircraft, if certain basic principles are accepted. Wherever possible more aircraft are being developed to carry patients. All Army Aviation units have an ancillary aeromedical evacuation role, provided the necessary medical equipment and personnel are made available.

In these cases the Medical Service normally informs the Staff of its requirements, designates forward and rear medical units, makes the necessary medical arrangements at both ends, and provides the necessary medical personnel and equipment. This type of evacuation is normally used for the movement of routine patients when other means of evacuation are inadequate or non-existent. Further, time is not at a premium as in the emergency cases. If adequate facilities are available forward for collection, treatment and holding, these patients may safely be held for reasonable periods while arrangements are being made for their evacuation. If properly prepared beforehand, these routine air evacuations do not normally require detailed skilled medical care during flight. This type of supplemental aeromedical evacuation closely approximates to support aeromedical evacuation. It is most commonly used in evacuation of isolated units largely dependent upon air transport for resupply and other administrative support.

The Army Medical Service must maintain jurisdiction over all Army aeromedical evacuation, regardless of the category of the patient or the source of the aircraft. This does not imply actual medical control of non-medical aircraft, but does include such matters as the designation of forward pick-up sites and rearward destinations, provision of necessary medical personnel and equipment, and surveillance of casualties in flight. All movement of patients must be planned and controlled.

SELECTIVITY

The selectivity inherent in aeromedical evacuation is not so apparent as its more obvious advantages in speed, range and flexibility. With adequate medical control of forward aeromedical evacuation, the individual casualty is no longer forced to be evacuated to a particular medical unit which happens to be in support of his formation. He may now be moved rapidly and safely to a medical unit best staffed and equipped for his particular type of wound. This in effect places a specialised treatment facility in direct support of every forward unit.

This also leads to economy of medical facilities. Specialists may now be concentrated in special units located well forward obviating the need for staffing and equipping forward medical units to cater for every type of patient. Surgical delays can be minimised and patient loads distributed equally through the available resources. The depletion of forward medical units of such items as splints, stretchers, blankets, etc. is avoided by exchange. The mobility of forward medical units is improved by the availability of atraumatic evacuation of patients which permits the unit to move without leaving behind large holding detachments.

CO-ORDINATION AND CO-OPERATION

To complete the picture, one must consider the integration of Army forward aeromedical evacuation with the Army ground evacuation, and the supporting evacuation provided by the Air Force and Navy. The Army still maintains its ability for ground evacuation by forward ambulance cars, and trains. Pending improvements in the performance of Army aircraft, continuity of medical service must be ensured. Forward medical units must be guaranteed that their casualties will be evacuated, regardless of weather or tactical situation. Other factors being equal, aeromedical evacuation will be used for the movement of the seriously wounded cases, and road evacuation will be used for the non-emergency and post-operative categories of patients. During periods when air is not available the ground means will also be used for the evacuation of emergency patients as in the past.

It is anticipated that those patients requiring evacuation from the combat zone will be turned over to the Air Force after they have received initial treatment, including surgery, in Army medical units. By this time the patient's condition will be such that he will not be jeopardised by the time required to arrange interservice supporting aeromedical evacuation. This has the further advantage of permitting full triage within the Army area and prevents over-evacuation of patients who need this.

In peninsular campaigns such as Korea, with Naval hospital ships located immediately off-shore, Army helicopters will be used to transport patients directly to these ships in the same manner as to Army medical units. Generally, Army medical units will be used to the fullest extent before evacuating to Naval hospital ships, and in any case, necessary arrangements will be made with the Naval authorities in advance. Regardless of the nature of the final unit within

the combat zone, the Army Medical Service must have control over forward aeromedical evacuation to ensure proper triage, prevent unnecessary evacuation and conserve the capabilities of the receiving medical unit.

CONCLUSION

These, then, are the basic Army concepts relating to forward aeromedical evacuation. They have been developed from experience, and are considered the best basis for current policy, organisation and procedure. Further, they provide guidance for the future.

Despite controversy as to the exact nature of future warfare and the organisation and employment of the Army of the future, the opinion is that nuclear as well as conventional weapons will be used freely and in great depth by both sides. As a result, it can be estimated that casualties will exceed any previous experience and that they will occur simultaneously in large numbers anywhere in the theatre. The front-line is a thing of the past.

It is also apparent that the Army of the future must make maximum use of the latest technical advances including aviation, must achieve greater flexibility and mobility, and must be capable of sustained, decentralised operations under a variety of conditions. Other trends indicate a reduction in the ratio of teeth to supporting arms and services, greater dispersion and a greater dependence upon air lines of communications.

These make much more difficult the task of the Army Medical Service. There will be greater numbers of casualties, within shorter periods of time, over a much larger area. Further, medical units must be smaller and more dispersed. More and more must be done with less and less. An equally important though less tangible consideration is the morale of the individual soldier and the continued fighting efficiency of the forward units. In isolated, dispersed positions, the soldier will become more and more concerned about his chances should he be wounded, and small mobile tactical units will only have a limited capacity for the care of patients.

The answer to a large part of the Army's problems is Army Aviation and its component, aeromedical evacuation. The medical service must maintain the same flexibility and mobility as the fighting units. The maximum use must be made of available medical means to meet almost insurmountable medical tasks. A more rapid, more selective system of evacuation seems to be the only method of minimising the discrepancy between medical requirements and the available medical resources. The question is no longer, "Can the Army afford forward aeromedical evacuation?" It is now "Can the Army afford *not* to use forward aeromedical evacuation?"

SURGERY AND THE MAU MAU

BY

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EVERY campaign presents problems peculiar to itself in the management of casualties, and the recent operations to eradicate the rebellious Mau Mau elements of the Kikuyu tribe in Kenya were no exception. This proved to be a campaign against a hidden enemy, the militant members of whom worked in gangs in the more inaccessible parts of the country, often hidden in forests at heights of up to fourteen thousand feet. Hence the gangs had to be searched for, and were rarely encountered in open country, so that anything in the nature of a fixed battle was unlikely.

As a consequence, casualties occurred sporadically, but when they did they were often in remote country far from a main road, at a considerable altitude, and exposed to wet and cold. The numbers involved were luckily small, although a second enemy in the shape of wild game was a constant source of danger, and charging rhinoceros accounted for several accidents, some of them fatal.

In circumstances such as these, the main problem was to enable the patient to reach a surgical centre with the minimum delay. Apart from the siting of two small hospitals well forward in the active areas, a solution was found in the use of a helicopter ambulance which could be summoned by wireless, could carry a medical officer with resuscitation equipment, and could land in forest clearings at a height of ten thousand feet. In this way serious casualties were back in the base hospital in Nairobi in an hour or two, and lives were saved which undoubtedly must have been lost, had the alternative of a journey lasting six or eight hours over indifferent roads been the only choice.

Clinical aspects. As might be expected, the major portion of the surgical work was unrelated to the nature of the campaign, and was such as would be found amongst any similar body of men elsewhere. The next largest group of cases were due to accidents, either gunshot wounds or accidents to vehicles, the latter being largely accounted for by the difficult conditions in many parts of the country. Finally a small but interesting number of cases resulted from big game accidents (see Table 1). The total numbers of operations performed in the East African Command during the years 1953 to 1956 are given in Table 2.

Table 1 shows statistically, the operative work done in the Command during the period.

Several points of general surgical interest arise from a study of the cases seen during the period under review.

Shock. The rapidity with which patients received adequate treatment, including transfusion (sometimes at the site of the accident) and the short lapse of time before they were admitted to hospital, played a major part in the preven-

Table 1. *Patients treated in the Military Hospital, Nairobi, 1953-1956 ; British and African Troops*

			1953	1954	1955	1956
Road Accidents :						
Causing fractures	...	...	16	7	37	9
Causing head injuries	...	...	14	21	28	12
Gunshot wounds :						
Involving bone	...	...	24	21	38	7
Not involving bone	...	...	27	21	22	5
Big game accidents	...	...	1	—	2	2
Other surgical conditions	...	...	229	625	897	447

Table 2. *Number of Operations performed in East Africa Command, 1953-1956 : British and African Troops and Others*

			1953	1954	1955	1956
Total operations performed	...	...	1775	2608	1657	1700
Open operations for fracture	...	...	18	12	15	23

tion of the stage of "irreversible shock" and very few cases of this nature were encountered. Adequate supplies of blood were always available from the Red Cross Blood Bank in Nairobi, and no patient died for lack of it.

Wound sepsis. This was no problem because the cases came to operation early. The general principles of toilet and "debridement" were carried out, but more primary wound closure was successfully attempted than would have been justified in the war of 1939-1945. The reasons for this were twofold. Firstly, there was no necessity to evacuate the patient after operation. He remained in the same hospital under the continuous supervision of the same surgeon until he was fit for discharge. Secondly, the antibiotic cover available was far greater than was the case fifteen years ago, and adequate facilities existed for laboratory control. Large muscle wounds were encased in padded plasters, and were found to fill in, or reach a suitable stage for skin grafting, more rapidly by this method than if subjected to frequent changes of dressing.

Gas gangrene was not seen at all during this period, and no case of tetanus occurred amongst British troops, though one fatal case occurred in an African. No major amputation was carried out during the whole campaign because of wound infection.

Tropical diseases. Surgery for conditions peculiar to the tropics has almost ceased to exist in the army, as judged by the cases seen in the period under review. Amongst British troops no single case of amœbic abscess of the liver came for surgical drainage. One or two cases of hæmaturia proved on cystoscopy to be due to bilharziasis. An even more remarkable change has occurred amongst the Africans. Fifteen years ago, in the same hospital in Nairobi, 25 per cent of the surgical beds were occupied by cases of tropical ulcer of the legs and ankles. In the past four years this condition has been a rarity. This change can be attributed to several factors : firstly, the general improvement in the standard of hygiene ; secondly, the more careful medical selection of recruits who are not suffering from years of malnutrition ; thirdly, the provision

of a better balanced diet ; fourthly, the fact that all African troops are now protected from the precipitating trauma which precedes tropical ulcer, by wearing boots and gaiters ; and lastly, that any case of trauma which showed signs of infection received controlled antibiotic therapy. It is probably this last factor which has been mainly responsible for an improvement which has saved thousands of man-hours for the King's African Rifles, for previously cases of ulcer occurred even in the well-clad and well-nourished askari.

Big game accidents. No exact figures are available for this small but interesting group of cases, but five such casualties were treated at the Military Hospital, Nairobi, during the period under review. One of these accidents was due to a buffalo, and the remainder to charging rhinoceros. The presence in the forest of these beasts, which weigh about a ton and can travel at thirty miles an hour, caused more anxiety to the troops than did the Mau Mau themselves. Four of the cases involved extensive wounds of the thigh with associated fractures. One of these died. The remaining case—a remarkable one—had the vault of his skull fractured like an eggshell, with lacerated brain tissue protruding from a parietal wound. He survived with no other disability than a mild spastic hemiplegia.

All but one of these cases were evacuated by helicopter and there can be no doubt that the rapidity with which they reached hospital was a major factor in saving their lives.

The following account of the method of dealing with the case of head injury, caused by a charging rhinoceros, is extracted from the personal report of the unit medical officer concerned :

"Lance-Corporal K. of the 7th(K) Battalion King's African Rifles was injured at 1000 hours on the edge of a clearing in the Mount Aberdare Forest . . . the platoon commander who was with the patrol realised the seriousness of the head injury, and informed Company H.Q. some fifteen minutes later that he wanted the helicopter ambulance. I . . . received the news further down the forest track . . . and decided to set out on foot . . . leaving at 1100 hours, and reaching the site at 1150 hours.

I found the injured man on his back in the bushes near a clearing . . . conscious but dazed . . . with a hernia cerebri in the right parietal region. . . . He had been given morphia gr. $\frac{1}{2}$ at 1015 hours . . . I decided that shock was imminent after his severe head injury and therefore cut down on his leg and gave him a pint of intravenous saline, followed by Dextran, which was still going as he was put in the aircraft. I also gave him brandy and phenobarbitone intramuscularly at 1225 hours, and covered the hernia cerebri with a shell dressing. . . . The helicopter landed twenty minutes after my arrival and took off with the patient at 1225 hours."

This patient was in the operating theatre in Nairobi within four and a half hours of his injury in the forest, a hundred and twenty miles away.

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TETRACYCLINE HYDROCHLORIDE IN THE TREATMENT OF NON-GONOCOCCAL URETHRITIS

BY

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THIS paper reports the results of treatment of 124 previously untreated cases of non-gonococcal urethritis with two preparations of tetracycline hydrochloride. Fifty-eight patients were treated with "Tetracyn" tablets (Pfizer) and 66 with "Achromycin" (Lederle)—a similar preparation of tetracycline hydrochloride in capsule form. The Tetracyn-treated group have previously been reported at an earlier stage of follow-up (Willcox, 1955). In both series one 250 mg. capsule was given four times daily for six days.

THE MATERIAL

The average age of the 124 patients was 29.8 years (extremes 20 to 51). There were 24 negroes, five from West Africa and 19 from the West Indies, one Indian, one Burmese and two Ceylonese: the remainder were white-skinned persons. In all, 45 were married, three were separated and 76 were single. Only 41 patients had had no previous venereal infection, but the remainder among them had suffered no fewer than 95 attacks of gonorrhœa, 93 of non-gonococcal urethritis (including one attack of Reiter's syndrome), four of syphilis, two of balanitis and one each of soft sore and herpes genitalis. Of the 28 non-white patients seven had had no previous venereal incident, but the remainder had had 25 attacks of gonorrhœa, 18 of non-gonococcal urethritis, one of syphilis and one of balanitis among them. The average number of previous venereal infections was 1.6 for both white and non-white persons.

The urethritis was apparently acquired from a stranger in 66, from a friend in 41 and from the wife in 13 cases. Three patients denied exposure and there was no record in one case. The apparent incubation period was one to seven days in 59 cases, eight to 14 days in 12, 15 to 21 days in nine, 21 to 28 days in eight and over a month in 11. It was impossible to assess in 25 cases.

The discharge had been present before treatment for one to three days in 53 cases, for four to six days in 14, for one to two weeks in 39 and for more than two weeks in 18. Dysuria was noted by 67 and not noted by 57. Gonorrhœa was excluded by urethral smear in all cases. The Wassermann and V.D.R.L. (Harris) serum tests for syphilis were negative in 111, the Wassermann test was negative and the V.D.R.L. test weakly positive in 10, the Wassermann test negative and the V.D.R.L. test positive in one, the Wassermann test weakly positive and the V.D.R.L. test negative in one, and the Wassermann test weakly positive and the V.D.R.L. test positive in one. The gonococcal complement fixation test was done in 101 cases. The result was negative in 92, weakly positive in one and positive in eight. Trichomonads were looked for by dark-field examination of the urethral discharge in 56 cases and found in three.

RESULTS

The results of the Tetracyn- and Achromycin-treated series are shown in Table 1.

Table 1. *Tetracyn and Achromycin in the treatment of non-gonococcal urethritis*

Duration of follow-up	Tetracyn series		Achromycin series	
	Number of cases followed	Number of failures	Number of cases followed	Number of failures
0	58	—	66	—
1-3 days ...	54	—	54	—
4-7 days ...	53	1	54	1
8-14 days ...	47	—	51	1
15-21 days ...	42	2 (1 reinfection)	43	2
22-28 days ...	37	3 (2 reinfections)	36	1
1-2 months ...	32	5	34	2 (1 reinfection)
2-3 months ...	17	—	24	2 (1 reinfection)
Over 3 months	8	(3)*	13	(1)*
Total	54	11 (20.4 per-cent)	54	9 (16.7 per cent)

* See text.

In one failure in the Tetracyn series there was no return of urethral discharge although pus was found in the prostatic bead. Failures occurring after three months of observation are automatically classified as reinfections. Before that time no attempt is made to differentiate between reinfection and relapse in the calculation of the failures given in the table, although the failures in which reinfection was considered to have been likely are indicated. If these are excluded there were in the patients followed up, eight failures (14.8 per cent) among those treated by Tetracyn and seven failures (13.0 per cent) among those treated by Achromycin. There was thus no significant difference in the results obtained by the two tetracycline preparations.

Of the three patients in whom trichomonads were found, retreatment was required in two at four and 21 days respectively on account of relapse although the trichomonads had apparently disappeared. In the third case the discharge disappeared but the trichomonads were still present at seven and 14 days. One urethral irrigation was given and the patient remained well. No trichomonads were found at 55 and 70 days after treatment with Achromycin.

Side-effects were minimal. A few patients complained of indigestion, dizziness and looseness of the bowels. One patient had marked ano-rectal pruritus. There was little to choose between the two preparations in this respect. In none was therapy interrupted because of side-effects.

The results obtained in the two groups have been combined in Table 2 and for convenience the results have been cumulated to take into account differences in follow-up.

Table 2. *Tetracycline hydrochloride in the treatment of non-gonococcal urethritis: Cumulative Results.*

Duration of follow-up	Number of cases followed	Number of failures	Cumulative per cent failing (including re-infections)
0	124	—	—
1-3 days	108	—	—
4-7 days	108	2	1.9
8-14 days	98	1	2.9
15-21 days	85	4	7.6
21-28 days	73	4	13.1
1-2 months	66	7	23.7
2-3 months	41	2	28.6
Over 3 months	21	(4)	—
Total	108	20	28.6

The results obtained by tetracycline hydrochloride resemble those obtained with the other tetracycline antibiotics, oxytetracycline and chlortetracycline. All of the broad spectrum group of antibiotics have given most satisfactory results in the treatment of non-gonococcal urethritis. The results of treatment of 807 previously untreated cases of this condition by various means are given in Table 3.

Table 3. *Results of treatment of 807 previously untreated cases of non-gonococcal urethritis by various means.*

Drug	Usual course	Number of cases treated	Number of cases followed	Number of failures	% Failure of those followed
Oxytetracycline	5-6 g.	85	82	13	15.9
Tetracycline hydrochloride	6 g.	124	108	20	18.5
Chlortetracycline	5-6 g.	115	108	20	18.5
Spiramycin	10-20 g.	87	77	16	20.8
Erythromycin	6 g.	101	85	23	27.1
Streptomycin	2-4 g.*	62	58	22	37.9
Sulphonamides	20-28 g.	55	53	21	39.6
Penicillin	1.0-3.6* mega units	70	65	26	40.0
Chloramphenicol	5-6 g.	39	37	15	40.5
Novobiocin	6-12 g.	40	36	20	55.6
Placebo	—	29	22	15	68.2
Total		807	731	211	28.9

* Given by injection.

SUMMARY AND CONCLUSIONS

One hundred and twenty-four male patients with non-gonococcal urethritis have been treated with two preparations of tetracycline hydrochloride, 58 with Tetracyn and 66 with Achromycin.

Of the 108 cases followed there were 20 failures (18.5 per cent) during the first three months of observation which includes possible reinfections. If the five possible reinfections are excluded the failure rate was only 13.9 per cent.

In another table the results have been cumulated to allow for differences in follow-up.

The results obtained in non-gonococcal urethritis treated with tetracycline hydrochloride have been contrasted with those obtained with 10 other drugs. The best results were noted with the tetracycline antibiotics, spiramycin and erythromycin. Indifferent or bad results accompanied treatment with streptomycin, sulphonamides, chloramphenicol, penicillin, novobiocin and a placebo.

Grateful acknowledgments are expressed to Messrs. Pfizer Ltd., of Folkestone, Kent, and to the Lederle Laboratories Division of Cyanamid Products Ltd., of London, for the supplies of "Tetracyn" and "Achromycin," respectively which were used in this study.

REFERENCE

WILLCOX, R. R. (1955). *Brit. J. vener. Dis.*, **31**, 186.

Obituary

MAJOR-GENERAL SIR COURTENAY MANIFOLD, K.C.B., C.M.G., M.B.

Major-General Sir Courtenay Manifold, K.C.B., C.M.G., died at Kyrenia, in Cyprus, on June 7th, 1957, at the age of 93 years. He had had a distinguished career in the Indian Medical Service in the field and as an administrator and traveller.

In a life which bridged six reigns, General Manifold had a very wide range of interests outside his profession, which his chosen career in the Indian Medical Service enabled him to further. For him to work in a country was not enough; he had to know that country, its peoples, its customs, and all its activities. He pursued these interests with the instinct and enthusiasm of the born explorer, and it was perhaps these qualities which brought success to the many special tasks he was called upon to undertake during his long and distinguished career.

Courtenay Clarke Manifold was born on 3rd April, 1864. His father was Surgeon-General M. F. Manifold, who had been administrative medical officer and controller of the Army Medical School at Netley. He was educated at Clifton College and Edinburgh University, where he graduated in 1886 and, after further studies under Sir James Cantlie (the father of our former Director-General) and at St. Mary's Hospital, he obtained one of the 28 vacancies in the Indian Medical Service for which there were over one hundred competitors.

After a brief interlude at the British Station Hospital, Lucknow, and with the 4th Bengal Cavalry, he was appointed medical officer to the Central India Horse. General Manifold recalls in his memoirs that during his two and a half months at Lucknow an officer died of enteric at least once a week, and that there was not a single army female nurse in any hospital in India at that time.

In 1893 he was appointed medical officer and Residency surgeon to the Indian State of Rampur in Rohilkhand, where he remained for the next six years. There was an interval of active service in 1897 on the Tirah campaign, for his work in which he was mentioned in despatches and awarded the medal and clasp. In 1899, he was deputed to go on a special mission to Western China and the following year he saw active service again, this time on the head-

quarters staff at the relief of Peking, and was specially promoted to the rank of Lieutenant-Colonel. He was thanked by Lord Kitchener for the work of a further mission to Central and Western China, of which he was in command. In 1903 he was awarded the MacGregor silver memorial medal, being the first medical officer to receive this award which was given annually for good work in exploration. For the next two years he was in command of a special mission to Tsu-Chuan and received the thanks of the Secretary of State for Foreign Affairs for the work accomplished.

From 1910 until the outbreak of the First World War, Manifold was Inspector-General of Civil Hospitals and a member of the Legislative Council of the United Provinces. In 1916 he was appointed Director of Medical Services of the 1st Australian and New Zealand Army Corps in the British Expeditionary Force. He was appointed C.M.G. and promoted Major-General in 1917 and became Director of Medical Services in 1918 at Anzac Headquarters in France. He was appointed Honorary Physician to the King the same year. He was mentioned in despatches twice and was awarded the Belgian Croix de Guerre for distinguished service in the field.

General Manifold was promoted K.C.B. in 1922 and retired from the Indian Medical Service the following year. Since 1935 he had lived at Kyrenia, in Cyprus, and during the Second World War served as Deputy Commissioner for the island for the War Organization of the British Red Cross and the Order of St. John.

Correspondence

From MAJOR J. A. H. BROWN, R.A.M.C.
and CAPTAIN H. S. BEDSON, R.A.M.C.

The Dangerous Universal Donor

SIR,

The remarks on blood transfusion made by Colonel A. J. Clyne in his article "The Resuscitation of Battle Casualties" which appeared in the January number* of the ROYAL ARMY MEDICAL CORPS JOURNAL have stimulated our interest in the old problem of the "universal donor." Although the practice of giving Group O blood to patients other than Group O is uncommon and to be avoided when possible, the fact remains that it has its place in emergencies. That this blood may on occasion cause reactions by virtue of its Anti-A and Anti-B antibodies is beyond doubt. It is accepted that the risk of these reactions can be reduced by testing Group O blood for its antibody content and thus discovering in advance the small proportion of potentially dangerous donors with high antibody titres. It is to the selection of a suitable test for this purpose and its routine employment that we would draw attention.

There has been no general agreement as to the nature of the Anti-A and Anti-B antibodies, which are important, and whether those principally concerned are hæmagglutinating, hæmolytic or immune. For this reason various tests and criteria have been described. In Korea, Steer (1953) and Crosby (1953) used a

* 1957

saline titration of hæmagglutinating antibodies and regarded blood with a titre of more than 1 : 200 as unsafe for universal use. Grove-Rasmussen *et al.* (1953) tested for immune antibodies in titres greater than 1 : 16 using an indirect Coombs test after partial absorption with group specific substances. Gardner & Tovey (1954) described a more simple test using an extension of the normal reverse-grouping technique to detect hæmolysins. In an extensive trial their test proved an adequate safeguard for the detection of blood with high titres of immune antibodies.

We have recently been advised by Dr. Tovey (1957) that the hæmolysin test has received wide acceptance and has been adopted by many of the Regional Transfusion Centres of the British National Blood Transfusion Service. It is well suited for routine use, being simple, requiring no specific reagents and apparatus, and involving little extra technical work.

We have commented upon this matter because we have ourselves only recently introduced this test and because we believe that it has not been widely used in transfusion services outside the United Kingdom. It is clearly a subject of importance to transfusion officers in minimising the risks of transfusion.

We are, etc.

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From COLONEL A. P. TRIMBLE, M.D., M.R.C.P.Ed.

SIR,

Lieut.-Colonel Mackay-Dick and Captain Robinson in their article on penicillin in the treatment of leptospirosis, published in the October number of the JOURNAL, misquote me. I did not say that penicillin was of no value in this disease. My words in the reference which they give were: "My own opinion is that there is some advantage if antibiotics are given very early in the disease; but it is extremely difficult to admit, diagnose and start specific treatment of cases of leptospirosis within 48 hours of the onset without haphazardly treating a number of quite unrelated diseases. Certainly we have as yet no true specific therapy such as we have for typhoid fever and scrub typhus."

Study of the body of their interesting and well-recorded article supports this more conservative view. In their series the average time off duty (about four weeks), the percentages of severe cases (15 per cent) and those showing extreme oliguria (6 per cent) are about what would be expected.

MEDICAL DIRECTORATE,
HEADQUARTERS,
BRITISH ARMY OF THE RHINE,
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I am, etc.

A. P. TRIMBLE.

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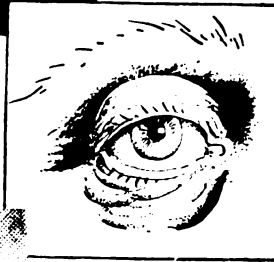
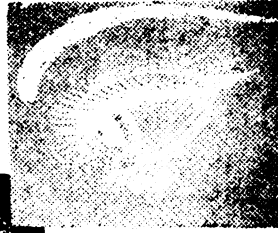
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CONTENTS

ORIGINAL COMMUNICATIONS		PAGE		PAGE	
The Health and Social Services of Cyprus. By Major G. F. Neild, M.R.C.S., D.P.H., D.I.H., R.A.M.C.		51	The Toxicity of Intracutaneous T.A.B. Vaccine. By A. A. Miles, M.D., F.R.C.P.		89
Observations on Snakes and Snake Bite in the Eastern Mediterranean Area. By J. L. Turk, M.B., B.S.		63	Acute Spinal Epidural Infection. By Sqn.- Leader D. D. Gibbs, B.A., B.M.(Oxon.), M.R.C.P., R.A.F.		93
Exercise "Medical Automedon", D.G.A.M.S. Annual Exercise, 1957. By Major-General F. M. Richardson, D.S.O., O.B.E., Q.H.S., M.D.		71	Obituary: Major-General D. T. Richardson, C.B., M.C., M.B., Ch.B., D.P.H.		99
Civil Affairs: Port Said. By Major T. C. R. Archer, M.B., D.P.H., R.A.M.C.		81	BOOK REVIEWS		101
An Unusual Case of Epithelioma Adenoides Cysticum. By Captain A. R. Pate, M.B., R.A.M.C. and Lieut.-Colonel P. D. Stewart, M.D., D.T.M. & H., R.A.M.C.		87	MATTERS OF INTEREST		103
			CORRESPONDENCE		104
			EDITORIAL NOTICES		105

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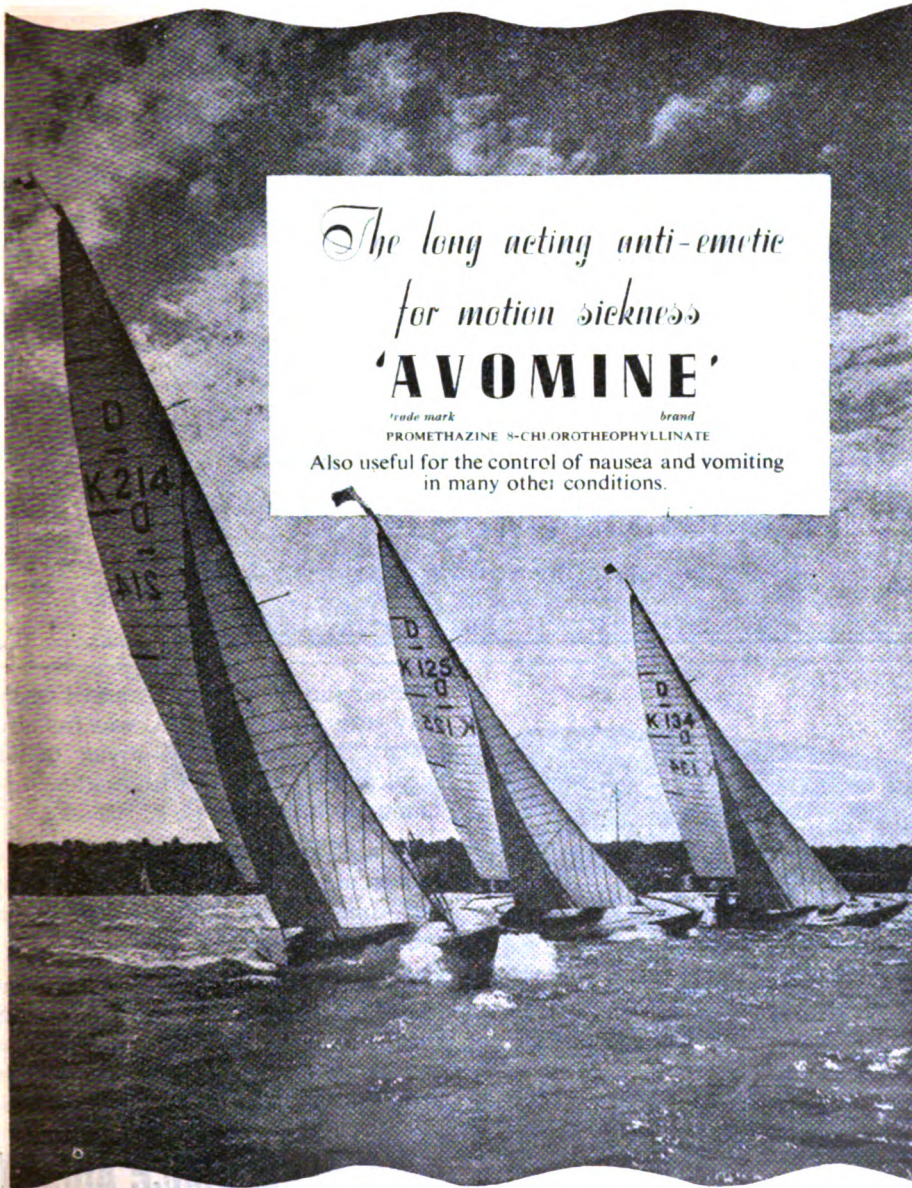
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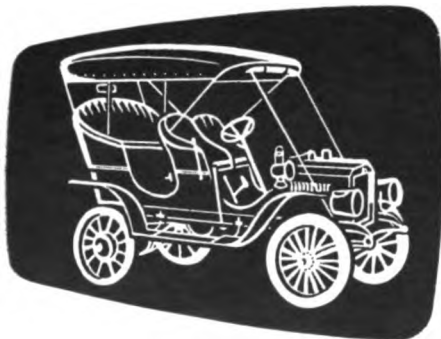
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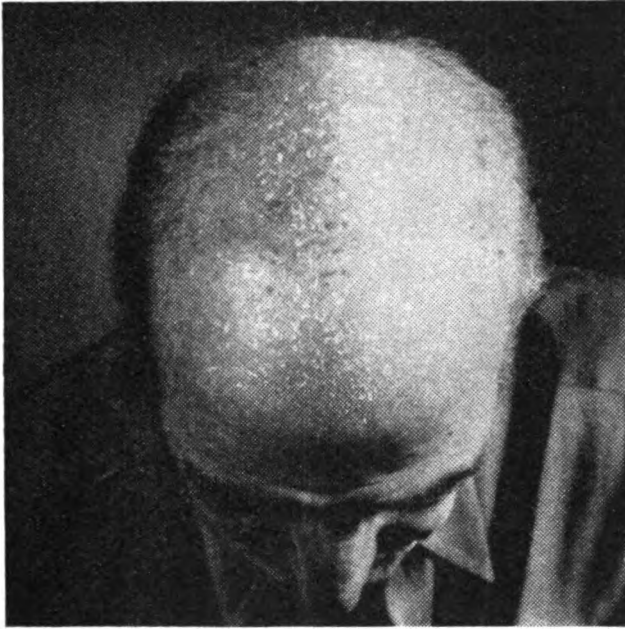
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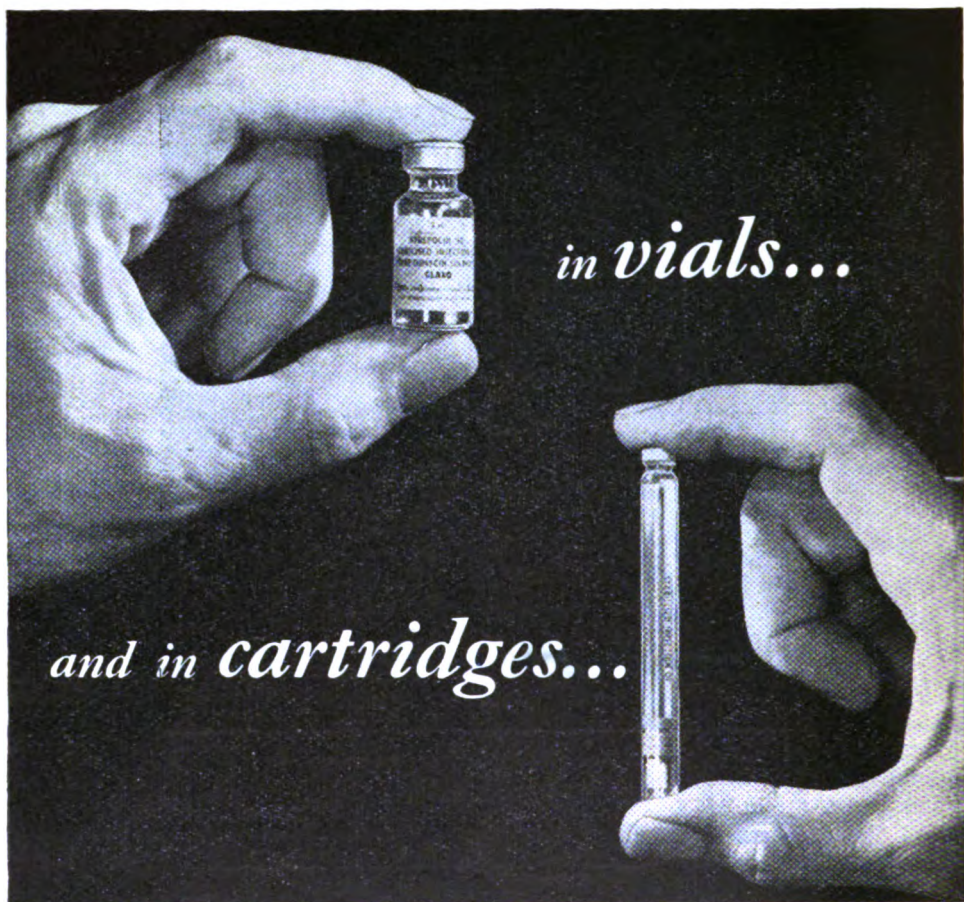
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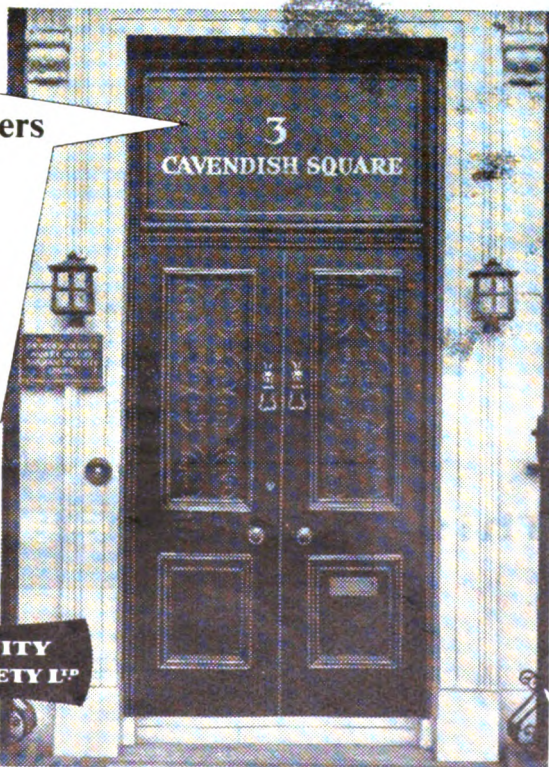
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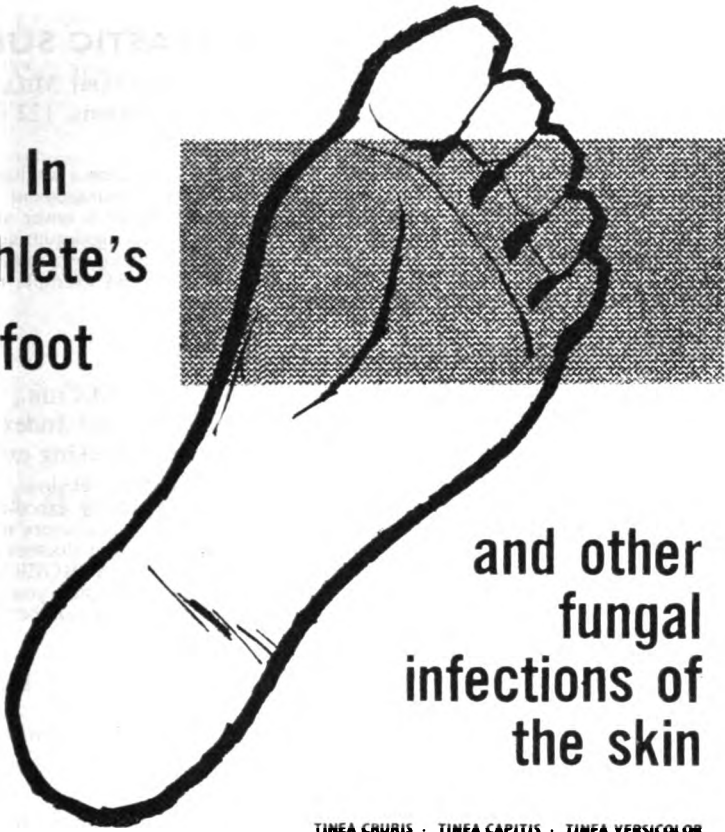
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Journal

of the

Royal Army Medical Corps

THE HEALTH AND SOCIAL SERVICES OF CYPRUS

BY

Major G. F. NEILD, M.R.C.S., D.P.H., D.I.H.

Royal Army Medical Corps

D.A.D.A.H., H.Q., Cyprus District

"You are welcome, Sir, to Cyprus."—Othello, Act IV, Scene 1.

Now that Cyprus is once again assuming the strategic importance that Disraeli first saw for it in 1878, it may be of interest to study the present state of the health and social services of the island. To appreciate these fully, however, it is necessary to know something about the country's background; its geography and climate, its history and its present administration.

GEOGRAPHY AND CLIMATE

Cyprus, a British Crown Colony, and the third largest island in the Mediterranean, lies about 240 miles north of Egypt, 60 miles west of Syria, 150 miles north-west of Israel and 40 miles south of Turkey. By the ancients, its shape was compared to an outstretched deer's skin, with the Karpas peninsula as the tail. The area is 3,572 square miles, less than half that of Wales, with a population of 524,000—approximately 80 per cent Greek, 18 per cent Turkish and 2 per cent Armenian, Maronite and others. The main towns are Nicosia,

the capital (population 47,000), Famagusta, which has the only enclosed harbour, Limassol, Larnaca, Paphos and Kyrenia.

For the most part the coast line is indented and rocky but interspersed are long sandy beaches. The north coast is bordered by a steep narrow belt of sandstone mountains, with an average height of 2,000 feet. In the south-west an extensive mountain range, covered with pine forest, dwarf oak, cypress and cedar, ends in the 6,400 feet peak of Mount Olympus, near Troodos. Between these ranges lies the broad fertile plain of Mesaoria, broken by occasional bare limestone escarpments.

The climate is sub-tropical. Winter on the plains is mild and invigorating with the temperature rarely falling below freezing-point, although the Troodos mountains are usually snow-bound for several weeks. In summer it is hot and dry on the plains, with temperatures rising to 110° F., while the humidity increases as the coast is approached. The rarer atmosphere of the hills inland, where the climate is equable and bracing, provides welcome relief. The rainy season lasts from November to March, the fall ranging from 14 inches in the plains to nearly 40 inches in the mountains, but there are relatively few days in the year when the sun does not shine.

HISTORY

The first recorded settlers around 3,700 B.C. were Stone Age people. Then under the name Alasia, Cyprus is recorded as one of the tributaries of the Pharaoh Thothmes III. After the Trojan wars, legendary heroes came to the island and founded settlements, bringing with them the Greek language and Olympian religion, while at Paphos the goddess Aphrodite first rose out of the Mediterranean. Assyrians, Egyptians and Persians all struggled in turn for Cyprus; in 58 B.C. the island became a Roman Province and was later converted to Christianity. On the partition of the Roman Empire, Cyprus came under the rule of Byzantium. After three centuries of Arab raiding, the island was occupied in 1191, by Richard Cœur de Lion while on his way to the Third Crusade. Cyprus then passed in turn to the Knights Templars; to Guy de Lusignan, who founded a three-hundred-year dynasty; to the Venetians in 1489, and, in 1571, to the Sultan of Turkey. The early rule of the Turks was popular as they liquidated the Latin Church and restored the Orthodox Archbishopric, in abeyance since 1275. Later the power of the Church so alarmed the Turks that in 1821 they executed the archbishop and bishops on the charge of conspiring with the insurgents of Greece, then struggling for independence. Nearly seven hundred years after Richard, the island returned to the administration of Britain, was annexed in 1914 and became a Crown Colony in 1925.

ADMINISTRATION

After the disturbances of 1931, due to the movement for union with Greece (Enosis), the Government was reconstituted without a Legislative Council and the legislative authority was entrusted to the Governor. The latter is

advised by the Executive Council, which comprises four *ex officio* members. In all the six district towns except Kyrenia, there is a resident District Commissioner, the local representative of the Government, who is responsible for supervising the work of municipalities and villages and for assisting and advising village commissions and municipal councils. In Kyrenia and the sub-district of Lefka there are resident Assistant Commissioners.

There are municipal corporations for the six big towns and for ten of the most important villages. Each corporation has an executive body composed of a mayor with from six to twelve councillors elected by a general vote of the population over twenty-one. The proportion of Greek to Turkish councillors is, as far as possible, the same as the proportion of Greek to Turkish inhabitants in the municipality. In addition to the municipal councils, the towns have in each quarter (suburb) a village commission with powers and duties similar to those in the larger villages. Municipal councils have a status roughly comparable with those in the United Kingdom. They do not, however, make any contribution to the maintenance of police. They are responsible for conservancy and the preservation of public health and safety within the municipal limits. They contribute with the Government towards the cost of such social welfare schemes as developing land for public utility or recreational purposes.

The affairs of the villages, which number 617 (excluding the ten rural municipalities), are managed by village commissions appointed by the Governor. Each village commission consists of a *mukhtar* (headman), who acts as president, and four *azas* (elders). In villages with a mixed population of Greeks and Turks a separate commission is appointed for each community when it numbers thirty or more. For the first time anywhere on the island a British *mukhtar* was elected to represent the interests of the British expatriates in Kyrenia at the end of 1955. The work of the *mukhtar*, assisted by the *azas*, is to keep the peace, and, as the local representative of the Government, to carry out local administration, such as registering births and deaths, issuing certificates of ownership of animals, conducting sales of immovable property in execution of judgment or mortgage debts, supervising rural constables (appointed for the protection of crops and animals) supervising and managing the village schools, subject to the directions of the Education Department, and assessing the ability of the inhabitants of the village to contribute towards them. (The salaries of the elementary school-teachers are paid by the Education Department).

In those villages (the majority) to which the Public Health (Villages) Law has been applied, village commissions have the additional task of authorising and supervising numerous works affecting public health, such as the erection of markets and slaughter-houses ; the lighting, cleaning and watering of streets ; the regulation of any trade or business injurious to public health ; the protection of water supplies from contamination ; and the imposition of fees and rates for carrying out such works.

here are also forty-seven villages which have been declared "Improvement Areas" under the Villages (Administration and Improvement) Laws, 1950 and 1953. These are administered by boards composed partly of officials and partly

of representatives elected at village meetings. These boards have powers and duties approximating to those of municipal corporations, though without the municipalities' heavy overhead expenses.

Besides the village commissions, boards and councils already mentioned, each District has a District Council with the Commissioner of the District as chairman, and as members, the Judge of the Family Court (*Evcaf*) a representative of the Greek community, a clerk in the office of the Commissioner, and six other persons appointed by the Governor. These District Councils are advisory bodies consulted by the Commissioners on various questions affecting the rural population.

PUBLIC HEALTH

General

Cyprus is a healthy country and the Convention diseases are unknown. Since the malaria eradication campaign was brought to a successful conclusion in 1950, not a single case of primary malaria has been reported in the island. Only sporadic cases of the other insect-borne diseases such as tick-borne typhus, relapsing fever, leishmaniasis, sandfly fever and dengue occur. The incidence of chicken-pox, whooping-cough, measles and scarlet fever is similar to that in the United Kingdom, while only a dozen or so cases of acute anterior poliomyelitis are notified a year. Diphtheria, however, remains a potential source of danger despite the inoculation campaigns which have been organised. There is still some reluctance on the part of parents to bring their children for immunisation at a sufficiently early age and there was a sharp outbreak in the autumn of 1956. Hydatid disease is still prevalent, but the incidence of typhoid and paratyphoid shows a steady decline. Poisoning from snake bite is uncommon, though fatalities have been reported in young children and dogs. Common snakes are *Vipera lebetina* and *Coluber jugularis*, the non-poisonous black rat snake.

Vital statistics

Infant mortality has been reduced by four-fifths in the past twenty-five years; in the early 1930's the infant mortality rate was between 140 and 150, whereas today the figure is down to 30 (25.4 was the corresponding U.K. figure for 1954). The crude death rate also shows a striking decline. At the beginning of the 1930s it was 17 per thousand, today it is only 5 (11.3 in U.K.). This gives Cyprus one of the lowest death rates in the world. The birth rate remains relatively high at 25 (15.2 in U.K.), and the population, now 524,000, is expected to exceed the million mark by the end of the century.

Environmental hygiene

Town and country planning. Since the last census in 1946, considerable migration from the villages to the towns has taken place. Land speculation in most of the towns is forcing an uneconomic scatter of suburban development, although this has to some extent been held in check by the lack of water supplies.

The old commercial centres of the towns were never designed for modern traffic and their roads are mostly inadequate. The following figures of the rapid growth of motor traffic give some measure of the problem : in 1946 there were on the road 4,060 motor vehicles and in 1955, 23,473—*i.e.*, one vehicle per 22 inhabitants. Incidentally, compulsory third party insurance was only enacted on 1st April, 1957. Until boom conditions arrived in Cyprus, most of the local authorities were not convinced of the need for regulating the location of incompatible land uses, small workshops, stores, shops and houses growing up cheek by jowl. With the present rapid development, the workshops have tended to develop into factories, small stores into warehouses and handicrafts into mechanised industries. During 1955 a bill was published providing for comprehensive Town and Country Planning. Diagnostic surveys are being carried out in the three main towns and the first Town Plan has been published.

Water supplies. Almost 80 per cent of villages in rural areas have piped supplies from deep wells. Those of Nicosia, Limassol, Ktima and Famagusta are the responsibility of Local Water Boards and are chlorinated, and although temporary shortages occur during the summer months the situation is a great improvement on that existing formerly with privately owned supplies.

Urban sanitation. There is no central sewerage system in any town, disposal being by septic tank or deep pit latrine. Refuse disposal is by tipping on land not far distant from the populated areas. The sewerage disposal plant for the Nicosia General Hospital and the Central Prison, the first in Cyprus, was completed in 1955 and is now functioning satisfactorily.

Rural sanitation. Slow but steady progress is being made in improving rural sanitation and in quite a number of villages each home has its own deep pit latrine.

Nutrition and food hygiene. Over the last decade the feeding habits of the population have changed very markedly and the former staple Mediterranean diet, particularly in rural areas, of bread, olives, vegetables and cheese, with meat as an infrequent addition, is now approaching that of central and northern Europe, with a rise in consumption of meat and eggs, while tinned stuffs, including meat and fish, are readily available even in remote villages. Meat inspection is carried out in all municipal *abattoirs* and in slaughter-houses erected in all major villages. In smaller villages no inspection is carried out and there is a potential health risk. In 1955 the Milk (Special Designation) Regulation was enacted. There is now one dairy in the Limassol area with an in-bottle pasteurisation plant and two dairies elsewhere which have reached the "Certified" standard requiring the overlapping metal cap. The others are of varying standards. The dairy cows, chiefly Shorthorns, are kept mainly for town supplies and are largely stall fed. The milk from sheep and goats is used almost entirely for the production of cheese and *yaourhti*. As all imported cattle are subjected to quarantine and tubercular reactors are destroyed, there is no bovine tuberculosis or abortus fever in the island.

Curative Medical Services

General hospitals are maintained by the Government in all the principal towns, the Nicosia hospital being the specialist centre and its superintendent the A.D.M.S. (Hospitals); patients requiring neuro-surgery, major plastic surgery, and corneal grafts have been sent, since 1952, to the United Kingdom. New hospitals have recently been constructed at Limassol, Famagusta and Paphos. In addition there are two sanatoria, one in the hills (115 beds) and the other outside Nicosia (50 beds); a Home for the Disabled (elderly leper cases—12 beds) and an isolation hospital (now one of the detention camps). Also there are thirteen small rural hospitals, maintained by local subscriptions and government subsidy, situated in various village centres, while the Cyprus Mines Corporation at Pendaya and Cyprus Asbestos Mines Company at Amiandos have fully staffed and equipped hospitals for their employees. In all there are 628 general beds or approximately 1.2 per 1,000 head of population.

Government medical officers, working under a district medical officer, carry out both curative and preventative work at dispensaries located at eighteen rural centres, and from there carry out regular weekly or bi-weekly visits to sub-dispensaries within the area under their control. These officers maintain close liaison with those of other departments such as school-teachers, agricultural assistants, district inspectors and so on, and assist in co-ordinating the work of preventative and curative medicine. In addition, there is a chest clinic in each of the five principal towns, and in February, 1957, a start was made with offering B.C.G. immunisation to all school-children entering secondary school and persons particularly at risk—*e.g.*, hospital staffs.

The cost of government treatment varies. To be seen as an out-patient by appointment costs 500 *mils* (10s.) ; without appointment, 250 *mils* (5s.) ; on a reduced medical charge certificate, 100 *mils* (2s.) ; and on a white certificate, nothing. A white certificate is granted by a *mukhtar* to persons on public assistance or earning less than 500 *mils* per day, while a reduced medical charge certificate is granted to those earning between 500 and 750 *mils* daily. As an in-patient the cost in a general ward for a white certificate is nothing, for a reduced medical charge certificate, 100 *mils* daily, and for a non-holder, subject to bed availability, 200 *mils* daily. There is in addition first and second class accommodation which costs respectively £1.500 *mils* and £0.750 *mils* daily with up to a similar amount in fees for medical treatment, while surgical charges vary according to the extent of the operation.

In addition to the government medical officers there are some 250 private practitioners working. Most of the doctors on the island are Greek Cypriots who qualified in Greece.

There are fifty-three private nursing homes functioning under licence. The size varies from three to four beds to fifty or more. Some of the larger ones are of excellent design with good surgical and radiological equipment, although satisfactory nursing staff is not always easy to obtain. In all, there are 726 private beds available. The charge for attendance is from 500 *mils* to two or three times this amount. The control of professional practice is vested in the Cyprus Medical

Council of which the Director of Medical Services is the chairman. The British Medical Association has a branch but only those with a United Kingdom qualification can join. Both the Greek Cypriots and the Turkish Cypriots have their own association.

Preventative Services

A full health inspector staff operates in both rural and urban areas, its members having been trained at the Health Inspectors School in Nicosia, which is recognised by the Royal Institute of Health. In the large municipal areas the sanitary work is the responsibility of the civic authorities, while the work in the smaller municipalities, rural areas and ports is undertaken by the Government under the over-all supervision of the A.D.M.S. (Public Health) and the Chief Health Inspector. In addition to the anti-typhoid and diphtheria immunisation campaigns, general improvement of the village sanitation, particularly in anti-fly measures, has been actively pursued.

Beside the training of health inspectors, the Medical Department is responsible for the training of nurses, health visitors, midwives, pharmacists, laboratory technicians and radiographers, and numerous undergraduate and post-graduate courses in the United Kingdom are available to departmental offices annually.

A health centre has been established in the Athienou area for nearly nine years. The unit with its main centres at Athienou and Lysi covers thirty-five villages and is staffed by two doctors, three health inspectors, a senior welfare officer with junior assistants, and six midwives. A mobile health unit operates in the Arminou area in Paphos District. Infant welfare centres, organised either by voluntary associations, municipalities or government, function in all the principal towns and many of the larger villages. These are well attended. Ante-natal clinics are held in all the municipal areas and many of the larger village centres. A fully equipped dental centre in the charge of a government dentist is attached to government general hospitals and various sub-centres are visited regularly from there. In addition, a mobile dental unit functions in each district, chiefly for school dental work.

The main pathology laboratory is centred in Nicosia, while there are satellite laboratories with trained technicians at Famagusta, Limassol and Paphos. The Government Analysts' laboratory is also centred at Nicosia, as well as the Blood Bank, first organised in 1953.

Voluntary Charitable Organisations

These carry out much excellent welfare work. The Anti-Tuberculosis League raises money, to which the Government adds £1 for £1, to provide relief in cash and kind for the dependents of patients in sanatoria. The local branch of the British Red Cross Society, organised into five divisions, one for each district, is engaged chiefly in welfare work such as domiciliary sick visiting, diversional therapy for hospital patients, distribution of clothing and so on. The main activities of the Order of St. John, which has ancient historical associations with the island, are the organisation of courses in first aid and home nursing.

EDUCATION

Primary

In spite of the fact that there is no compulsion, well over 90 per cent of children of primary school age attend. The primary school is free and is attended by children between the ages of six and fourteen, during which time they are expected to complete a six-year course. Each village has its school, except where the village is so small that it is more practicable to transport the half-dozen or so children to the next nearest school. In 1955 such arrangements were made for only 100-150 children, so that in over half the primary schools in Cyprus, varying in size from five to sixty children, one teacher has to teach all six age groups. At the primary stage there are separate schools for each community, the curriculum being controlled by the Government, who pay 72 per cent of the total cost, the rest being found by the local community. Since heating is normally only provided in the hills, it is necessary to take advantage elsewhere of the abundant Cyprus sunshine. The rooms are usually 30 feet by 20 feet wide giving a floor area of 600 square feet which allows about 15 square feet per child in a class of average size. The school garden is the centre of the science lesson, since science is largely rural science.

Secondary

These vary very much from their primary counterparts in practically every respect. The secondary schools have diverse methods of government and are virtually independent of external authority except in so far as all schools must be registered under the Secondary Education Law and are subject to inspection by the Education Department. So far as the curriculum is concerned, the governing body considers what type of education is most suitable for its pupils and then chooses whether to follow the course laid down in Athens or Ankara, whether to go in for commerce or to prepare its pupils for the Cyprus Certificate and General Certificate of Education examinations. If a school chooses to adopt the Greek curriculum and is recognised as a Greek gymnasium, its pupils who complete the course and gain a diploma will be able, without further examination, to enter a Greek university. Of the Greek Cypriot secondary school pupils in the island, just over a half attend a school recognised by the Greek Ministry of Education and conducted largely as if it were actually sited in Greece.

Post-Secondary

There is no post-secondary education in Cyprus except for the Teachers' Training College and Mistresses' Training Centre, which altogether have places for some 320 students who will eventually teach in the primary schools. Those seeking other post-secondary education must go abroad, and in 1955 it was estimated that approximately 400 were studying in the United Kingdom, 300 in Athens and 200 in Ankara or Istanbul.

Recently the Government of Cyprus has announced the offer of scholarships in a variety of subjects "which will help the development of the island's economic and cultural life." These scholarships, for courses leading to university degrees

or equivalent professional qualifications, will be tenable at universities or equivalent institutions in the United Kingdom for varying periods up to four years. The normal maximum value of each scholarship will be £300 a year, but in cases of need this may be increased, although it will not exceed a total value of £500. The scholarships are not conditional upon service with the Government, but the holder on completion of his course must return to Cyprus and work in the island for at least five years, so that he will be working for the good of his country in repayment for the public funds which have been spent on his education.

Special schools

Physically and mentally handicapped children are often neglected and become a responsibility of the Welfare Department because of inadequate care by the parents. On the other hand, there are still a number of children physically and mentally handicapped who are in fact well cared for by their parents and who would respond to special education but are unable to benefit from ordinary schooling. For these, special schools are still needed. In fact there are only two in Cyprus, the St. Barnabas School for the Blind (twenty places) and the Rotary School for the Deaf and Dumb (forty-two places).

School health

There is as yet no organised school medical service in the island. Many of the secondary schools employ a general practitioner as a school doctor and government medical officers visit the primary schools at regular intervals as part of their normal duties, while much dental work is carried out in rural areas by mobile dental units. In 1955, just over 44,000 child inspections or treatments were carried out. Oculists also visit the schools. Supplementary feeding of certain school-children is undertaken; this in the majority of cases consists of milk, but in certain cases a free meal is provided for poor children.

HEALTH AND WELFARE OF EMPLOYED PERSONS

Although Cyprus is predominantly an agricultural country, nearly 6,500 persons are employed in mining activities and a further 61,500 in other industries, which are steadily increasing and include factories for the manufacture or production of a large range of consumer goods, from textiles, soft and alcoholic drinks, to buttons and artificial teeth. To facilitate commerce, the old currency of pounds, shillings and piastres was decimalised on 1st August, 1955, by retaining the pound (£) as the standard unit and dividing it into 1,000 *mils*. During 1955, a year of full employment, the health of the working population was satisfactory, no industrial diseases being reported. The majority of accidents were due to transport mishaps and falls of persons or material, one-third of which occurred in building and civil engineering works.

On 2nd April, 1957, the Factories Law, 1956, to replace the Trade and Industries (Regulation) Law, took effect. This law models itself very closely on the English Factories Acts of 1937 and 1948. Meanwhile, of course, there has

always been the Workman's Compensation Law of 1951. On 7th January, 1957, the Social Insurance Law took effect. This requires all employed persons between the ages of 18 and 65 with certain exceptions, mainly government employees, to contribute weekly 60 *mils* (1s. 2d.) for a man, and 30 *mils* (7d.) for a woman. Equivalent contributions are paid by the employer and the Government. Providing certain minimum contribution conditions have been carried out, the weekly rate for sickness and unemployment benefit, and widows' and old age pensions is £1.200 *mils* (£1 4s.) weekly for a maximum period of 156 days. Increase for one dependent is 600 *mils* (12s.) and two or more 900 *mils* (18s.). Orphans' benefit is 600 *mils* weekly. Both marriage and death grants are £10, while the maternity grant is £5. There are also reduced rates or amounts of benefit for those who have only paid a proportion of the required contributions.

Previously only the big mining corporations, Cyprus Mines Corporation and Cyprus Asbestos Mines, maintained an industrial health service, although certain Trade Union organisations have established out-patient clinics at Nicosia, Famagusta and Limassol for the care of their members and families. There is also a Government Social Insurance scheme for their own employees and for those of quasi-government organisations, such as Cable and Wireless, Cyprus Airways, the Electricity Authority, Nicosia and Famagusta Water Boards and Kyrenia municipality. The benefits include forty days' paid sick leave, free treatment for wives and families, maternity benefits and charitable grants in case of need. Contributions from both employee and employer are at the rate of 11 *mils* per week for each pound earned.

SOCIAL DEVELOPMENT

In October, 1955, the work of the Director of Welfare Services was increased by adding the supervision of Community Development which might be described as "better people in a better society". Social Development has two aspects—one mainly intensive and individual (Social Welfare) and the other more general and extensive (Community Development).

Now that the usual social problems of industrial and urban growth, including delinquency and deprivation amongst children, are appearing, services to deal with them are provided by the Welfare Department. They include five Children's Homes for deprived children and a boarding-out scheme for such children—in all 100 children are in care. Apart from this, there is an orphanage in Nicosia, provided by the Greek Orthodox Church, and one or two day nurseries provided by local authorities or voluntary societies. The limited number of voluntary and private welfare schemes for children is partly to be explained by the fairly recent economic expansion of the island and the strong family life which provides for most children an affectionate upbringing. The Education Department is in charge of the Reform school (72 boys under 16) at Lapithos and after-care hostels, for which the Medical Department provides a variety of ancillary medical services. There is no remand home in Cyprus, probation for juveniles being an established feature of the penal system. In addition any child

or young person found to be in need of care or protection, or exposed to moral danger, can be brought before the Court under Section 15 of the Juvenile Offenders Law. In the absence of a suitable person to care for the child, an order can be made committing the child to the Director of Welfare Services, who makes suitable arrangements for the child to be put in a home or boarded out.

Up to now, for the aged in Cyprus, there have been no old age pensions. This is not surprising in a community just developing from a peasant economy and where the tradition of building houses for one's female children and endowing them with all their inheritance when they marry is still widespread. In return the children are expected to maintain their parents in their old age. With the growth of towns and the changing pattern of family life there is an increasing number of people who are unable to follow the traditional pattern of providing for their old age, and for these the Government Public Assistance scheme, administered by the Welfare Department through District Welfare Committees, relieves distress. During 1955, 2,705 persons were helped, 1,898 Greek Cypriots, 782 Turkish Cypriots and 36 from other communities ; old age accounted for 1,265 cases, followed by 513 of sickness. Indoor relief for poor people is provided by most municipalities. These poor houses, although open to all who need them, are really shelters for the aged and the accommodation provided is very limited.

The court welfare officer is as freely available to the adult court as to the juvenile one, but, as in the United Kingdom, he tends to be used more by the courts dealing with children and young persons. Matrimonial cases do not concern adult courts in Cyprus quite as much as in the United Kingdom as Greek Cypriot marriages are governed by the Ecclesiastical Law, and for Turkish domestic affairs there is a Turkish Family Court. The after-care of discharged prisoners is supervised by the Welfare Department, also responsible for family care.

DISCUSSION

The modern aspects of civilisation, which in the west have evolved slowly, have in the last few years been introduced into this island with startling rapidity. The mechanical and industrial advantages have been grasped quickly by the younger generation, although many of them have peasant or rural upbringing and have come from mud-brick, crudely plastered huts and simple village life to the modern dwellings, as we know them, with electricity, modern plumbing, refrigerators, and washing machines. But this advance is only to be seen in the towns and, by contrast, in the country many a farmer tills his land with a simple plough drawn by a donkey or bullock, sows and reaps his crops by hand and winnows his grain. The tarmac roads which are rapidly spreading over the island still have to have a rough earth or cobble-stone verge for donkey traffic. To the visitor it is an island of contrasts ; the intense heat and drought of the summer months and the snow-capped mountains and heavy rains of the winter ; the profusion of multi-coloured spring flowers followed by months of scorched arid earth ; limousines and donkeys.

Before the war there were anything up to 18,000 cases of malaria a year, and the freeing of the island from malaria must stand as a landmark in the achievements of the Government Health Services. This has been followed by a tremendous improvement in the physique of the people, coupled with a positive approach to health and the participation by nearly all young people in sports, such as football, athletics and swimming. Great strides have been made in land development by irrigation and improvement in crops, but a growing problem is that of refuse disposal. When, as previously, this was almost entirely organic, the farmer was glad to plough it in as a potential fertiliser, but now with increased urbanisation and more widespread use of tinned stuffs, this is no longer feasible. The indiscriminate tipping of refuse, largely old tin cans, is disfiguring to the countryside and constitutes an ever-increasing danger to public health.

In the last two years the main hospitals have been enlarged and modernised. Only the mental one lags behind and to improve conditions it is hoped soon to build new accommodation in Larnaca. Per head of population, there would appear to be an adequate number of private practitioners in urban areas, but medical attention is relatively expensive and one of the main points raised by the Trade Unions is that there should be free medical treatment and drugs under the new Social Insurance Law. In the hill villages, during anti-Eoka sweeps, the unit regimental medical officers have found great response to their offers of professional services.

Against the background of two years of unrest and disturbances, the progress and advancement of all health and social services continues, the proposed expenditure on them in the 1957 Budget being no less than 20 per cent of the total to be spent on existing government services. It is also to be noted that there has been no opposition to all the improvements offered, although a certain number of village and urban *mukhtars* have failed to carry out their duties, such as registering births and deaths in their areas, as part of a campaign of passive resistance organised by the Ethnarchy Council. Coupled with the improvement in land, living, and industrial conditions must come the education of the youth, but it is interesting to note, especially in the light of recent events, that in the majority of secondary schools the syllabus of education is laid down by outside governments and that virtually no opportunity for post-secondary education is available on the island. In the case of doctors, although a number of them have gone to the United Kingdom for post-graduate training, the majority received their primary qualifications in Athens or a Turkish university, and for the few qualifying in western Europe, the universities in the United Kingdom only rank equally with other continental countries. A lot has been heard of the strife between the two major communities, but it is perhaps forgotten that many of the early detainees were arrested for their communist affiliations. Now that the Radcliffe proposals have been announced, it is to be sincerely hoped that a way out of the present intractable political impasse may be found and that Cyprus may continue to develop its wealth of opportunities and regain its sunny charm.

OBSERVATIONS ON SNAKES AND SNAKE BITE IN THE EASTERN MEDITERRANEAN AREA

BY

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INTRODUCTION

This paper is based on the author's experience while working in Israel, Egypt and Cyprus and therefore covers only these areas. From the point of view of its snake fauna, the eastern Mediterranean may be divided geographically into two parts, a northern and a southern area. The northern area, which extends north from the latitude of Jerusalem to include the southern shores of Asia Minor, the Lebanon, Israel and Cyprus, is a fertile green belt containing some mountainous districts. The southern area, with the exception of the Nile delta, is mainly desert as typified by the Suez Canal zone, the Sinai, the Negev and Aqaba.

The basic fauna of these two areas have little in common, although there is some overlap, especially in Israel where the fauna of the two areas may be found side by side. The fauna of the northern area is a continuation of that found in the European continent, the common snakes being non-poisonous Colubridæ and the only common poisonous snakes being *Vipera lebetina* and *Vipera palæstina*. In the southern area the snakes are those specifically associated with the deserts of North Africa and Arabia as typified by the sand vipers and the Egyptian cobra. In the northern area the poisonous snake is a rarity, whereas in the southern area the majority of snakes are poisonous.

This paper describes the commoner snakes found, with a view to their easier identification ; the pathological and clinical features of snake bite are discussed and the different forms of treatment reviewed. Only 18 of the 42 or more species found in the area are mentioned ; these include all the poisonous species and those of the non-poisonous species which are most frequently found.

IDENTIFICATION

Snakes cannot be fully identified by colour or superficial markings as these vary from area to area. Note therefore should be taken of the shape of the head ; the distribution of shields on the head, especially those behind the eye (postocular and temporal) ; the number of shields under the body (ventral) and under the tail (subcaudal) ; and the shape of the pupil.

The Colubridæ and Viperidæ may be distinguished by a number of characteristics. The Colubridæ have a head which is continuous with the body and which is covered with large plates ; the pupil is generally circular and the tail is long

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and slender. The Elapidæ are related to the Colubridæ, but form a separate family. They have large head plates like the Colubridæ and poison fangs which are partially canalised and situated in the anterior part of the jaw. In the Viperidæ the head is distinct from its neck and is generally heart-shaped covered with small shields or scales ; the pupil is vertical and the tail short and dumpy. All vipers are poisonous and have a pair of large anterior canalculated poison fangs supported by mobile maxillary, palatine and pterygoid bones.

SNAKES OF THE NORTHERN AREA

COLUBRIDÆ

The Colubridæ are divided into the Aglyphæ, in which the teeth are solid and which do not secrete venom, and the Opisthoglyphæ, which have one or more of the posterior maxillary teeth grooved and which secrete a mildly toxic venom. This venom is poisonous to lizards and other small animals but not to man. Among the Aglyphæ are the water snakes *Natrix natrix* and *Natrix tessellatus*. *Coluber jugularis* and *Coluber nummifer* are other Aglyphæ commonly seen in this area. *Malpolon monspessulanus* and *Telescopus fallax* are the common Opisthoglyphæ.

Natrix natrix has a wide distribution occurring throughout Europe, Asia Minor and Cyprus. It may reach a length of nearly seven feet. The coloration is olive, olive grey or brown with black spots, and with a white or yellow collar.

Natrix tessellatus is found in Syria, Israel and the Nile delta as well as in Europe and Asia Minor, but does not occur in Cyprus. It rarely grows longer than three feet. It is generally more brightly coloured than *Natrix natrix*, its spots are in three longitudinal rows with a more or less regular chess pattern, and it has a distinct V-shaped dark band dorsally at the junction of the body and the head.

Coluber jugularis has a wide distribution occurring in Asia Minor, Syria and Israel ; it is one of the commonest snakes found in Cyprus, where it is known as the black rat snake, owing to its habit of catching small rodents by constricting them. Small specimens up to three and a half feet long are pale olive with numerous black spots which in the very young may be tinged with orange. The adult, which may grow up to eight feet, is bluish black in colour with a cream coloured underside.

Coluber nummifer is also very common in Cyprus and Israel and is usually found in built-up areas. It is sandy coloured with three to five alternating series of dark brown, black-edged spots. The median series of these are large and rhomboidal. This pattern superficially resembles that often found in *Vipera palestina*, but the shape of the head and the large head shields of the Colubridæ should make the difference obvious. This snake may grow up to eight feet in length.

Malpolon monspessulanus is widely distributed throughout the Mediterranean and is common in Cyprus, Israel, Jordan and Egypt. It is dark brown in colour

with small dark or black spots accompanied by yellowish or white streaks. The head markings are white and consist mainly of V-shaped marks over the parietal head shields. It may reach up to six and a half feet in length.

Telescopus fallax is a small snake, reaching a maximum of two and a half feet in length. It is very common in Cyprus and also occurs in Asia Minor. It has a grey coloration with brown or black spots or bars on the body. It has a pair of enlarged grooved fangs situated below the posterior border of the eye. It is a nocturnal creature and, unlike most Colubridæ, its pupil is vertical. It is known as the cat snake because of the way in which it stalks its prey.

VIPERIDÆ

Vipera lebetina is the only poisonous snake found in Cyprus and it also occurs over a wide area, including the Greek isles, Turkey, the Lebanon, Syria, Iraq and North Africa. Its head is heart-shaped and it has a distinct neck. Its tail is small—generally a tenth of its total body length. Its head is covered with small scales which are keeled like those on its body, while its pupil is vertical. These snakes may reach a length of four and a half feet. In Cyprus, where it is known as "Kufi" it is grey, greyish buff or brown with two dorsal series of darker spots or orange bars which may however be indistinct.

Vipera palestina is found in the Lebanon, Israel and Jordan. It is olive drab to reddish brown and on its back there is a dark brown zigzag or wavy band which may separate into single square or rhomboid spots. On the sides are large vertical markings with lighter centres, in the intervals of the dorsal band. Otherwise this snake resembles *Vipera lebetina*. Its habitat may extend down into the southern area, and one was received from as far south as Ma'an in Jordan.

OTHER FAMILIES

The Greek blind snake *Typhlops vermicularis*, which is non-poisonous, is quite common in Cyprus. It is a member of the family Typhlopidae and bears a superficial resemblance to an earthworm and in fact burrows into the ground. It has small lateral eyes and on close inspection is found to be scaled as a snake. *Eryx jaculus*, a small member of the boa family, is found on the mainland but not in Cyprus.

SNAKES OF THE SOUTHERN AREA

These are mainly sand vipers with an occasional elapid. Among the non-poisonous Colubridæ found are *Natrix tessellatus*, *Malpolon monspessulanus*, and *Spalerosophis diadema*, which is red in colour with a dorsal series of brown rhomboids.

VIPERIDÆ

These mostly conform to the general type of viper described above, but they are all much smaller and well camouflaged, being almost invisible in the desert.

Cerastes cerastes, the horned viper, is a very small snake rarely reaching more than one and a half feet in length. It has characteristically a horn consisting of a

scale standing above each eye, the eyes being directed upwards. It is light sandy yellowish grey in colour with dark brown spots on its back and a dark stripe behind the eye. It moves by throwing agile loops one after the other and buries itself in the sand. Round the Dead Sea and the gulf of Aqaba, it is often found without a horn.

Cerastes vipera is the common sand viper of North Africa. It is very similar to the horned viper and is also sand-coloured. It is shorter and stouter and does not have horns. It is found in Egypt but does not extend into Asia.

Echis colorata is a small snake rarely reaching more than one and a half feet in length. It is related to *Echis carinatus*, which is widely distributed throughout North Africa, Iraq, Persia and India. *Echis colorata* itself is found in limited areas around the gulf of Aqaba, the Red Sea and Southern Arabia. Its head is distinct from its neck and is roughly triangular. The tail is a little under a quarter of the length of its whole body. It is a sandy grey colour with a row of whitish spots with dark brown edges on the back and two to three rows of irregularly placed dark spots on the sides. Though a small snake, *Echis colorata* is very poisonous. It buries itself in the sand and therefore may easily be trodden upon or kicked.

Pseudocerastes fieldii is a rare form of horned viper and is usually only one and a half feet in length when fully grown. Its head is roughly triangular and is covered with small scales, which cover a broadly pointed horn above each eye. It is usually pale yellowish grey in colour with indistinct markings. It is found in a limited area around the gulf of Aqaba.

Atractaspis engaddensis is a highly poisonous viper which has the superficial appearance of a colubrid with large head shields. It is blue-black in colour and has recently been described in the Sinai and Negev (Haas, 1951).

ELAPIDÆ

Naja haje, the Egyptian cobra, is a large snake reaching up to six and a half feet in length. It forms a hood by spreading its anterior ribs and thus widening its neck. This hood is narrower than that of the Indian cobra and spreads farther down its body. Its colour varies from uniform yellow grey to brown and its scales are dull. It is highly poisonous.

Walterinnesia aegypti is similar to *Naja haje* but is black and does not have a hood. Superficially it may be mistaken for *Coluber jugularis*, but the latter has a more slender neck and is rarely found in sandy terrain. *Walterinnesia aegypti* occurs mainly in Egypt but also has been described in southern Israel (Haas, 1951).

NATURE AND ACTION OF SNAKE VENOM

Snake venom is a clear, colourless fluid which consists mainly of proteins, peptones and polypeptides. It also contains enzymes such as hyaluronidase (Duran-Reynals, 1939), proteases, fibrinolysins, cytolytins and agglutinins. The proteins of cobra venom have a molecular weight of between 2,500 and

4,000. It is absorbed by way of the blood-stream and has a very quick action. Viper venom proteins have a molecular weight of about 20,000. It spreads by the lymphatics and has a relatively slow action. It has been shown that if the lymph flow to a limb is obstructed, viper venom is not absorbed (Barnes & Trueta, 1941).

Viper and cobra venoms have different actions. Viper venom acts mainly on the vascular system whereas cobra venom acts mainly upon the nervous system bringing about respiratory collapse. Viper venom spreads by the lymphatics and local signs usually develop within an hour ; the first sign is bruising round the site of entry, which may generally be seen as two small puncture marks. Blisters filled with sero-sanguineous fluid also appear round the bite. Swelling of the whole limb develops, and it may also become covered with ecchymoses. It may be three to four days before the swelling reaches its maximum, and the affected limb may become twice its original diameter. At autopsy this is found to be due to hæmorrhage into the subcutaneous fat and underlying muscle. On incision of the skin, sero-sanguineous fluid exudes freely. The regional lymph nodes are invariably swollen and hæmorrhagic. In bites of the lower limb, hæmorrhage may be seen spreading up the psoas major muscle and in the retroperitoneal tissue on the side of the bite. If the bite is in the upper limb the whole of the chest wall and the side of the neck on the affected side may also be involved in the hæmorrhagic process. In fatal cases autopsy shows a severe hæmorrhagic state of the internal organs. There is often a blood-stained peritoneal exudate, and massive hæmorrhage into the mesentery. Hæmorrhage into the gastric mucosa may be very severe. When the intestines are involved, the hæmorrhage is mainly into the muscle coats. The kidneys are congested and there may be hæmorrhage into the lumen of Bowman's capsule. There may be large ecchymoses in the endocardium of the left ventricle, but this is no more than that seen sometimes as a result of shock or in violent deaths. Lymphocytic infiltration of the suprarenals has been described (Efrati & Reif, 1953).

CLINICAL COURSE

Cobra bite

The local symptoms produced by an injection of cobra venom may be slight. There may be some œdema, inflammation or loss of sensation in the limb. Nausea and vomiting supervene rapidly. After an hour the patient becomes dull and apathetic. Paralysis begins from the extremities, then passes up to the thorax so that respiratory distress becomes apparent. The patient may eventually die from asphyxia due to acute respiratory failure. Death may occur within four hours. Should the patient survive, recovery is rapid.

Viper bite

The local findings as a result of viper bite have been described above. Viper bite may also give rise to a generalised constitutional upset. The rapidity with which this develops has a serious bearing on the prognosis. It may develop as early as half an hour after the bite. The first sign is severe vomiting, which may

be followed by intense diarrhœa. The diarrhœa is probably related to the massive intestinal and mesenteric hæmorrhage which occurs. Shock may rapidly supervene. The blood pressure may fall below 70 mm. of mercury and there may be profound anæmia, associated with the passage of blood and tissue fluid into the affected limb. On admission to hospital, the patient may at first be found to have a hæmoconcentration in which the hæmoglobin level may rise to 20 g. per cent. There is at first loss of plasma into the affected limb and later of red cells as the damage increases, and the patient will be found anæmic after twenty-four hours. Hæmolysis does not occur as a result of the bite of any of the vipers in this region, and the anæmia is always due to a loss of blood into the affected limb or a result of hæmorrhage elsewhere. There is generally a leucocytosis which may be as high as 20,000-30,000 white cells per c. mm. In cases which survive these constitutional changes there is a risk of renal failure developing after seven days.

INCIDENCE AND PROGNOSIS

Amongst troops in the Suez Canal zone snake bite was almost unknown. In Cyprus, viper bite is rare and when it occurs is mild, generalised symptoms do not develop, and in most cases there are only local symptoms in the affected limb. The incidence is only four or five cases a year in the whole island, and the only fatal case in ten years was in a two-year-old child.

In Israel, where viper bite is mainly from *Vipera palæstina*, cases are more common and the effects more profound. Out of 300 cases recorded between 1931 and 1953 there were 21 fatalities, giving a 7 per cent mortality (Theodor, 1954). The incidence of constitutional disturbance was also much higher. Out of 65 cases described by Efrati & Reif (1953), shock developed in 40 per cent. Fatalities are recorded as a result of the bite of *Echis colorata* (Theodor, 1954).

In both Israel and Cyprus snake bite has a definite epidemic incidence, the peak occurring in June, July and August. This is because the snakes tend to hibernate in the colder winter months.

If untreated, the bite of the Egyptian cobra may prove fatal ; however, should the patient survive paralysis, recovery is rapid. Generally snake bites of the head, neck or upper limbs have a much poorer prognosis than those of the lower limbs.

TREATMENT

Local treatment

The classical local treatment is deep incision of the bite and the application of local suction, combined with a tourniquet just above venous pressure, placed round the limb, to inhibit the spread of venom from the affected limb and to encourage the collection of œdema fluid to dilute the venom and assist drainage. Cauterisation and the application of permanganate crystals should not be encouraged as they have no rationale and, moreover, predispose to infection.

Efrati & Reif (1953) doubt the effect of compression of the limb in cases of viper bite, since the venom is slowly absorbed by the lymphatics. In these cases

treatment should consist of complete immobilisation of the limb by the use of sand-bags or a split plaster. If the patient has to be conveyed over long distances, the application of a Thomas splint would appear to be indicated. Incision and drainage have not been shown to be particularly helpful in these cases.

In the cases of cobra bite where absorption of venom is rapid and through the blood-stream a tourniquet should still be applied, the usual precautions being observed.

General treatment

Viper bite. An intravenous antihistamine drug such as Benadryl (5 mg.) has been found effective in cases where symptoms may resemble those of anaphylactic shock (Efrati & Reif, 1953). Shock should be combated vigorously by transfusions as blood is the substance lost in these cases. The general principle should be to keep the systolic blood pressure above 100 mm. of mercury to prevent the development of renal failure later. Electrolyte imbalances should also be corrected. ACTH and cortisone have been tried in several cases. The rationale for their use is that they cause retention of fluids, diminish capillary permeability and diminish the effect of hyaluronidase.

Cobra bite. The treatment of cobra bite is the treatment of acute respiratory failure and consists of artificial respiration, oxygen and the injection of respiratory stimulants. Artificial respiration may prove life saving.

Antivenenes

The Institut Pasteur produces four polyvalent antisera prepared in horses hyperimmunised against snake venoms. Of these AN (Afrique Nord) is the most useful in this area, as it contains the specific antitoxins against the venoms of *Cerastes* and *Naja*. Sergeant (1944) has shown that the antiserum produced against the venom of *cerastes* also has a marked protective effect against the venom of *Vipera lebetina*. The antiserum C (Cobra) is specific for all forms of cobra, including the Egyptian cobra. Antitoxins against *Echis carinatus* are found in the polyvalent antiserum AO (Afrique Occidentale) from the Institut Pasteur, and a specific antiserum against this snake is also produced by Behringwerke Aktiengesellschaft. These antisera are said to be effective against *Echis colorata*. AO serum also contains antibodies against cobra venom. Specific antiserum against *Vipera palestina* is being produced by the Institut Pasteur in Paris (Theodor, 1954).

The form of treatment recommended by the Institut Pasteur is that 10 ml. of the antiserum be injected as soon as possible after the bite, subcutaneously into the thigh or in the neighbourhood of the bite, the dosage being the same for adults and children. The serum should be administered if necessary in further 10 ml. doses, if the first has led to any improvement in the condition of the patient. In exceptional cases where the patient's condition is critical, it may be given intravenously. In this case care should be taken to see the patient does not develop an anaphylactic reaction.

SUMMARY

Observations have been made on the snake fauna of the countries in the Eastern Mediterranean area. Emphasis has been laid on the different species occurring in the northern and southern halves of the area. The nature of the different venoms, their pathological and clinical effects, and the treatment of the different forms of snake bite encountered in the area have been discussed. Mention has also been made of the different antivenenes available.

I would like to thank Colonel W. Stewart, M.B.E., Lieut.-Colonel Mary Munro, R.A.M.C., and Dr. H. W. Parker of the British Museum for their advice and criticism ; also Colonel W. A. Y. Knight, A.D.M.S., Cyprus district, Major C. C. Langford, R.A.M.C., S.M.O. Jordan and all other medical officers who sent snakes into the Command Medical Laboratory, Cyprus.

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EXERCISE "MEDICAL AUTOMEDON"

D.G.A.M.S. ANNUAL EXERCISE, 1957

BY

Major-General F. M. RICHARDSON, D.S.O., O.B.E., Q.H.S., M.D.

*"A chiel's amang you, taking notes,
And, faith, he'll prent it."*

ROBERT BURNS.

THIS year's exercise had a markedly Scottish flavour. Good Scots tongues abounded to cheer the heart of the exile. But that is not the reason for the quotation above. As I am a bagpipe enthusiast it is apt to be assumed that I am a Scotsman of the perfervid "here's tae us wha's like us damn few and they're a' deid" type, and consequently a lover of Burns. Far from it. For me the admitted magnificence of "Tam O'Shanter" and some other poems barely balances the mawkish sentimentality of "The Cotter's Saturday Night"; and far too much of the drivel in collected works would barely qualify Rabbie for a job writing those little slips that go inside crackers. I think that Scots are slightly ridiculous in annually celebrating such a "national hero," when there are so many more deserving of honour if we really must have a pretext for those annual orgies at which the English are softened up with rich feasting until they are ready to listen with fuddled benignity to our assurances of our inherent superiority. A Scots writer diagnosed all this as a manifestation of a racial sense of inferiority, a disability from which the English have never suffered. What Scotsman has ever been offered so much as a cup of tea on St. George's Day? Although I have never demeaned a noble instrument by piping in a haggis, a quotation or two from Burns stick in my mind, and this one is very appropriate to my situation at Mytchett, having been detailed again by the Editor to be his reporter of the D.G.'s annual exercise. So, in the words of an Aberdeen soldier who never varied the opening sentence of his weekly letters from the Western Desert in all the months during which I had to censor them, "Here I am again wi' ma wee bit gossip."

First of all the presiding genius of the exercise was defined in the programme as follows :

"During the fighting before Troy, Achilles put his armour at the disposal of Patroklos, much against his better judgement. Patroklos, after fighting bravely, hazarded his (or rather Achilles') armour, lost it, and was killed.

Command then devolved upon Automedon, the 'breaker of the ranks of men' who fought 'swooping with his chariot as a vulture on wild geese.'

Automedon, an ex-cavalry officer, at one stage of the battle had to be restrained from taking his fighting vehicle too close to the foot soldiers. Later he showed good generalship in deciding to fight dismounted at a time when infantry was needed. But although he saved the day he could not capture the lost armour.

The medical services were not much in evidence. In fact, only Phoebus Apollo could claim any success in treating battle casualties. When called on by one of the wounded, he quickly managed to arrest hæmorrhage, used some form of analgaesic therapy and 'straightway made his pains to cease.' Apart from this one case, mortality among the wounded was extremely high."

Automedon himself, a magnificent figure authentically dressed in Greek uniform of leather and bronze, made periodic appearances, at one of which he neatly accounted for his presence by saying that he was there to try to convince senior officers that they enjoyed the benefits of a classical education. This set me off on research into the correct pronunciation of his name, for I mistrusted the apparently accepted "ortomēdon" and inclined towards "ortōmedon." However, I find that although the "e" is undoubtedly an epsilon it is the second "o" which is an omega, so I suppose we all ought to have been saying "örtö-mÿdōan," which sounds like those jingling little nonsenses which kept coming into hexameters and pentameters and all that.

This year's opening narrative had been issued in advance, which caused an uneasy feeling that one ought to have put in some pre-exercise work. But any clouding of the carefree spirit in which we usually assemble to hear the tale unfold was allayed by the finely painted proscenium on which we saw the map of the slightly Dardanelly imaginary lands in which we were to study limited war operations of the type with which our army must always be ready to deal. The public health aspects of Dost, the friendly country which our expeditionary force was to help, had a familiar ring, and some bitter lessons from history could have been cited in support of the A.D.A.H.'s resolute decision to leave at once by air for liaison and personal study of army health problems. The initial force planning was ably presented by Western Command. The Field Training Centre team, in yet one more attempt to master the visual aids to what Colonel John Douglas used to call "the reading of the laundry list," kept pace with the build-up of medical units by building castles on the floor model, not with bricks, but with veritable seed-boxes. Some critics thought that more hospital beds should have been established in Dost, and we never heard Colonel Curran's reasons for not wanting them, for I am sure that he did not. If he had wanted them he would have got them. No mere staff officer could have stood up to him, to judge by the spirited way in which he dealt with the discussion. During this serial we learned that the bagpipe is classified in the Ordnance Vocabulary as a musical instrument, and close to the bag of that instrument follows the Millbank bag for filtering water—water! What would a former Duke of Atholl's piper have thought of this? When caught by the duke drinking the tumbler of whisky given to him for seasoning the bag he explained "She aye likes it blowed in." Really the more delicate bits of unconscious humour in the Ordnance Vocabulary far excel those widely—indeed broadly—quoted items about crockery. "Tables—holy" for example; and the sword carried by general officers—"Swords, scimitar, with handles Mameluke."

The talk on logistics given by Brigadier P. H. Man, the Director of Administrative Planning, was most interesting and highly entertaining. I remember a previous D.A.P. saying that as those in Whitehall are too busy to think, they have a habit of de-centralising the duty of thinking. Anyone who reads Brigadier Man's paper in the exercise report will find plenty to think about.

The first morning ended with a well-staged demonstration by the Cambridge Military Hospital of Field Medical Company Training, the more acceptable term for what began as "brick" training. Few readers of this Journal can fail to be aware that what began so recently as last year's exercise as what I called a phase in the search for the medical critical mass in nuclear warfare, has now passed beyond the stage of study of the establishment for a sub-unit from which may be built various types of field medical units, and has led to widespread experimentation with a form of training designed to multiply the hands available to carry out a variety of medical procedures in the care of casualties in grave emergencies, even if the brains controlling some of the hands do not comprehend the full significance of what they are doing. "Procedure training" was one term I heard used for it. The first of the basic procedures elaborated by Major-General Woods' committee is Preparation of Accommodation, and this was demonstrated by the Cambridge Hospital medical company who marched on to the music of the Corps band.

After lunch there was a session on guided missiles during which our old friend Mr. Neville Gadsby, the Deputy Scientific Adviser at the War Office, described recent advances, and Lieut.-Colonel Levis dealt with medical standards for those who handle these missiles in a talk illustrated by playlets staged by the Army School of Health in which we saw graphic presentations of the hazards which surround them. Finally the victim of one of these accidents, W. O. Wakes, kindly came along to describe his experience. He attributed the saving of his eyesight to the prompt action of his comrades well trained in first aid.

Meanwhile things had not been going too well in Dost where both British and Dost forces had sustained casualties from nuclear attack and where the enemy had established air superiority, though luckily it was believed that they had for the time being no more nuclear missiles available. The second problem dealt with a brigade group which had taken up a strong defensive position from which no evacuation by air or other means was expected to be possible for several days, which was a serious matter for it already had 700 casualties, and a further 200 casualties daily from conventional attack were anticipated.

Lieut.-Colonel Maclaine, the spokesman for Southern Command, outlined the points to which attention had been given in the brigade's field ambulance during the training phase, which included procedure training designed to ensure that the unit could care for 600 serious cases for several days, 100 in each section and 200 in H.Q., although still prepared, as every field ambulance must be, to handle considerably greater numbers of light cases as well. He had asked for a lot of useful, in fact essential, extra equipment, and anyone who was or had been a field ambulance C.O. must have wished him luck in finding transport to carry it ; but here I must add that at several points during the exercise we saw

encouraging evidence of the progress being made in reducing the weight, and of equal significance to field medical units, the bulk, of several items of medical equipment.

The tactical picture of the isolated brigade group was then painted for us by the Field Training Centre, and "painted" was the word for they used plywood "goose-eggs" so prepared that they glowed brilliantly when the lights went out and ultra-violet lamps went on. I think this little act was staged as much for their own enjoyment as for ours, and it was really too bad next day when it was repeated for some distinguished visitors that the ultra-violet lamp became transiently temperamental. When it came to hearing Lieut.-Colonel Maclaine report to the D.D.M.S. how his unit had coped with the battle we were not a bit surprised to hear that, true to the tradition of field ambulances, they had succeeded in collecting all the casualties and by many improvisations getting them all eventually under cover. Nor were we surprised that Colonel Barnetson, who easily qualified for the post of Leader of the House in this year's Shadow Cabinet, deplored the use of ambulance cars as "small wards," which would make a good field ambulance C.O. feel as uneasy as an armoured regimental commander with all his tanks dug in as anti-tank guns. I day-dreamed briefly of an occasion when a D.D.M.S. had ordered me to surrender temporarily one or two of my twenty four-stretcher ambulance cars—yes, we had *twenty* in those days in a light field ambulance—and I pleaded that its ambulance cars were the umbilical cord of a brigade which if carefully preserved whilst it lay coiled in the warm womb of the training area would save lives when it was delivered on the cold bed of the battlefield. When I say that the D.D.M.S. was that redoubtable brigadier known to a far wider circle than his own beloved 43 Division as "Sandy" no one will be surprised to learn that he had no difficulty in cutting the cord and getting his ambulance cars. During Lieut.-Colonel Maclaine's report the D.D.M.S. was subjected to a torrent of well-meant advice and criticisms, based on experience of real hard campaigning, from Automedon whom he seemed to find unbearably tedious in the role of back-seat charioteer. It was in fact an all too obvious reminder of the fate of those who reminisce of past campaigns that poor Automedon was treated with far less respect than was Deucalion last year, although in his robust soldierly manner he was an almost equally dignified presence. Almost—for it must be confessed that it was a pity that all those Scottish friends had not been able to teach him the art, an art possibly only acquired by those who start young, of sitting in the kilt with graceful discretion.

*"Oh, wad some power the giftie gie us
To see oursel's as others see us!"**

(from the orchestra stalls)

Discussion on the isolated brigade's medical problems was opened by Captain Bryson, who described his experiences with a field ambulance at Arnhem in a most interesting short talk, which gave special pleasure to Colonel Graeme Warrack who was also there.

* Do you English know that these well-known lines come from Burns' ode "To a Louse. On seeing one on a lady's bonnet at church"?

After tea we saw a splendid demonstration by The David Bruce Laboratories and the National Blood Transfusion Service. We were shown the organisation of a centre for rapid collection of blood from donors, and also some interesting new equipment such as plastic bags to replace the usual bottles. Nearly five hundred officers and men from Aldershot District had volunteered as donors and the demonstration was thus a most profitable one in more ways than one and was a happy example of co-operation between the Army and the National Blood Transfusion Service. This demonstration was run by our esteemed editor, and by way of congratulation I can do no better than record that Colonel Crosby, the head of the Transfusion Department of the Walter Reed Hospital, Washington, said that it was one of the best demonstrations of transfusion equipment he had seen. In a brief talk he stressed the value of standardisation of our equipment with that of the United States army, and said that he liked the look of some of our equipment.

The important subject of acclimatisation had been introduced early in the day when the D.D.M.S., with medal ribbons and gorget patches on his bare chest, was put into a portable Turkish bath and emerged shrunk to less than half his size—a phenomenon well within the powers of the dramatic effects department of the Field Training Centre. The old story of the Afrika Korps being rapidly acclimatised in greenhouses was described as a myth by the Director of Army Health in an address which was punctuated by voices off—by the good broad Scots of Dr. Parkes, Dr. Barclay, R.M.O. of the 43rd Foot in the mid-nineteenth century (whom we saw sitting under a punkah in a red coat lent by that famous regiment, one of Wellington's best) and by muttered comments from a Macedonian and a crusader, who trudged across the stage in their heavy kit in striking contrast with a modern British soldier in his shorts. These little interludes were really excellently done, as well as anything of the sort I have seen, but I doubt if they really made the subject-matter of an important talk any easier to absorb. I for one could have listened without pain to a straight lecture by Brigadier Capon for more than his allotted thirty minutes.

An extremely varied first day ended in the cinema with a demonstration of night signs and a film of the Maralinga nuclear test explosion. Then, as a nine-hour day could hardly satisfy the D.G., he allowed a few of us to see after dinner an excellent film of methods of burns treatment being used in Baghdad.

Next morning whilst we were assembling for an outdoor demonstration described in the programme as "Research Projects" a Scots Guards piper in full dress, feather bonnet and all, marched up and down piping, and piping very well indeed, whilst wearing what looked like a small respirator. Soon we saw a squad of Guards recruits drilling, men playing football, doing P.T. and so on, and in each group a few men were wearing this device, which Major J. M. Adam introduced to us as the "Imp"—the Integrating Motor Pneumotachograph. The descriptive word "portable," which as you have gathered it deserves, was excluded from its title, as Major Adam explained, for reasons of euphony. It was then demonstrated how this ingenious instrument was devised and how it has been used by the Diet and Energy Team working with the Medical Research

Council to study men's output of energy in almost every conceivable kind of military activity and in their daily lives, and so helped to estimate their dietary needs with scientific accuracy. One of the demonstrators was Mr. Wolff, the inventor of the device, and to him fell the privilege of presenting to Piper Blair the traditional piper's dram which he sucked skilfully through a tube in his "Imp," a feat which he successfully performed some four times or more as the different groups came round.

The patience and inventive genius which had been put into the elaboration of these scientific investigations compelled our admiration, but I did reflect that the answer to the question whether the soldier's ration satisfies his needs has been tersely expressed for some time by the soldier himself; and I wondered what the N.A.A.F.I. will say to the Diet and Energy Team if they produce a ration which does satisfy those needs.

When we reassembled in the gymnasium the D.G. announced that Surgeon Captain C. B. Nicholson had presented Mytchett with a ship's bell. Later on "Nick," who must have felt that the methods hitherto used to persuade the milling horde of senior officers to hurry to their seats lacked dignity, was persuaded by the D.G. to give the bell a ceremonial and very nautical tonk, not the last one by many that he will hear at Mytchett, we all hope.

By now the situation in Dost looked brighter. The enemy were withdrawing, the isolated brigade was being relieved and there was even a helicopter to spare to give the D.D.M.S. and his inseparable companion Automedon a hurrl—sorry, a lift. We heard from Lieut.-Colonel Marshall the Northern Command idea of how the A.D.M.S. of "W" Force would have appreciated the situation when given the task of dealing with 1,200 casualties held within the isolated brigade's perimeter after the brigade was relieved.

After lunch we went first to the Royal Aircraft Establishment at Farnborough, where the R.A.F. medical services gave us a most interesting demonstration of some aspects of casualty air evacuation and air transport support of the army. A Casualty Air Evacuation Flight less its two sections had set up a Reception Tent, a Holding Tent, and an Emplaning Tent. The first two are self-explanatory, and in the third we saw patients being prepared for a flight, fitted with safety harnesses, and briefed, before being loaded into a Beverley aircraft. We then saw a second Beverley loaded with 48 stretcher cases and 28 sitting in the boom, and finally a Beverley with a platform loaded for a medical heavy drop. This load had not as yet been test-dropped and came in for some dubious glances, but this was a mere detail which will of course be cleared up by the airborne experts. The demonstration gave us a good insight into what the R.A.F. can do for us.

From Farnborough we went to the Long Valley, where the 2nd Battalion The Parachute Regiment and 23 Parachute Field Ambulance gave a splendid demonstration of a brigade in a defensive position tackling the exercise problem of holding numerous casualties. As we approached the battlefield a mounted policeman was a nostalgic reminder, in these days of spaceupmanship, of the part once played by the horse—of how staunch Copenhagen carried his master

all over the battlefield throughout that "hard pounding" day of Waterloo, whilst Napoleon sat chain-snuffing on a kitchen chair outside La Belle Alliance for most of the day until that last despairing gesture when he stood with his cloak thrown back to let the advancing Old Guard see his decorations. Copenhagen could claim some share of the credit when the Duke said to Creevey on the day after the battle, "By God! I don't think it would have done if I had not been there."* (1)

Unlike the Western Desert, the Long Valley could not be cleared of its normal inhabitants, and when our bus arrived it scared a young girl's high-spirited pony, sparking off another fleeting battlefield picture of "ane gay palfray, littil and joly" which carried another conquering hero—Robert Bruce at Bannockburn.

At a company position we saw an enemy attack and the work of the company aid post, and then an R.A.P., C.C.P., and A.D.S. were visited, all well dug down and with many casualties held in bull-dozed excavations. The A.D.S. was holding 300 seriously wounded men and was not overlooking any aspect of their prolonged care, even occupational therapy. The A.C.C. Training Centre had laid on an impressive demonstration of field cooking, and Major Harwood was there again to tell us about it. The nature of the country lent itself to the use of what they called "dozer scrapes," which in some parts of the Normandy bridge-head were a very mixed blessing in wet weather. I can suggest no better solution to the digging problem, but their drainage will probably always be difficult. I heard criticisms that notices more appropriate to the departments of a hospital struck an unrealistic note, but we should have remembered how the soldier does indeed adapt himself in that way to the conditions of prolonged defence. During the tea interval there was a demonstration of neuro-surgical cases being prepared for evacuation and loaded into a Westland helicopter, and finally we saw a demonstration of how a field medical company from a general hospital would, after the relief of the beleaguered brigade, come forward and take over a number of its casualties.

This is a colourless account of a really fine demonstration, but it must be remembered that this article aims at increasing the number of those who will read all about it in the official report of the exercise. Those who planned the layout of the brigade position, the carefully timed progression round it of the various groups, and the many realistic sights which we saw, should have little difficulty in planning the medical support for real operations.

Two more flags joined the table decorations at the exercise dinner, for we had with us Brigadier Rauch, Surgeon General Union Defence Forces, Major-General Refshauge, the D.G.M.S. of Australia, who was already well known at Mytchett, and Major Paige of the Royal Australian Army Nursing Corps. We missed Generals Burki, Chaudhuri and Hayes and Brigadier Shier, but they had all sent one or more of their officers, the United States being especially strongly represented. Major-General Powell had come from SHAPE.

* Peterborough in the *Daily Telegraph* recently pointed out that Sir Winston Churchill, like Guedalla, misquoted this as "would not have been done."

Two papers read on the last morning should be studied in the final report by everyone—Mr. Walpole Lewin on the Neurosurgical Casualty and Lieut.-Colonel Burbridge on Field Medical Company Training. No D.G.'s exercise is truly satisfying without some really high-class professional leaven, and this Mr. Lewin provided in its most palatable form. For all he had to tell us in his own special sphere, he found time to sound a very important note of warning on the wider aspects of the surgical problem when he said that the young general surgeon of today is not so "general" as one might think. He then said, "In the future, therefore, the Army may have to find some way of training sufficient young general surgeons quickly in traumatic surgery, and I think it is a problem which is likely to demand a good deal of thought and co-operation between army and civilian personnel. Indeed I would feel that one of the main tasks of the army medical services in the future may be to lead the way, as indeed they have done in so many other fields in the past, in the reintegration of the various surgical disciplines."

Mr. Lewin's talk stirred up a spirited discussion in which, amongst others, we heard Colonels Raven, Todd, Willcox and Warrack. The airborne incursion from beyond the Tartan Curtain was occasioned by Mr. Lewin's suggestion that the neurosurgeon should tackle everything above the neck, and Colonel Warrack, a distinguished dental surgeon, put in a claim for the maxillo-facial surgeon. But the military analogy is inappropriate here. The frontiers of Dost were forgotten, and the brass plates gleamed undimmed by camouflage. Medicine in the wider sense may know no frontiers, but an occasional border foray between medicine in the narrower sense and surgery is always good fun, and I was a bit surprised that the physicians in this discussion allowed a surgeon to get away with the remark that the neurosurgical team "carried" a physician. That verb has a certain connotation nicely illustrated at a guest night at which a burly staff captain bore a small brigade major around the ante-room crying out "Q carries G, as usual." Lieut.-Colonel Burbridge's talk was full of interesting sidelights on this training in mass casualty management which those engaged in it will find helpful. As he said, the new approach in which the procedures in the care of patients are taught by rote rather than by reason, has captured the interest of the trainees, but the background of anatomical and physiological information must be painted in, especially for the more intelligent and inquiring trainees, if the skill is to stick. In many other forms of training men are found to take much greater interest in the theories once they have seen the practice. An interesting point was that the "casualties" provided by the R.A.M.C. Depot were so interested that several became regular recruits. In Germany we have been struck by the interest taken by large numbers of men of combatant units who have been subjected to the discomforts of being faked casualties. Their interest in first aid training seems to be stimulated by the experience. Lieut.-Colonel Burbridge quoted a member of the Army Nursing Advisory Board who said, "At least you have proved that it is possible to train the virtually untrainable."

This year again we saw various interesting types of equipment which are undergoing user trials, and once again we thought—roll on the day when we get

some of it. In Lieut.-Colonel Waterston's demonstration of Medical Self Service, dealing with casualties under pressure, we saw a fine new type of burns dressing which achieves a notable reduction in bulk, 100 going in the space of 16 of the old type. When certain difficulties in sterilisation are overcome it will be a real advance.

After reports on A.E.R. and T.A. training, we heard some remarks by Colonel Hughes for the A.E.R. and Brigadier Ward for the T.A. Brigadier Ward was encouraging in his belief that the old volunteer spirit is returning in the Territorial Army. Colonel Hughes's short speech was in effect an affirmation of A.E.R. loyalty to the Corps and to the D.G. himself, and of their readiness to go anywhere and do anything. No one was better qualified than Colonel Hughes to make that affirmation, for during the recent Suez crisis he left his civilian practice to command his general hospital with great success.

The general discussion on the lessons of the exercise and the D.G.'s closing remarks reflected not only the pleasure that we all get from these annual meetings of old and new friends in the military medical world but the stimulus we all receive to our work and thought.

The general staging of Automedon was well up to the high standard which the Field Training Centre sets itself. The "drops" were in various colours against a black background and were well chosen, although when the Commandant of the Army School of Health during one serial exhibited the armorial bearings of the Earls of Perth it seemed that his knowledge of heraldry had dimmed his appreciation of the situation. Why should the Drummonds, of all clans, need to "gang warily" at Mytchett? The drill for changing floor models was impressive, and the playlets were well acted, brief and to the point, in obedience to the maxim that the fun must not fog the facts. It was a joy to see an old star back again in Lieut.-Colonel Irvine, and though we missed Captain Critchley on the stage he was very active behind it. I did not believe him when he claimed to have retired from acting after an unkind review by some petty dramatic critic. Obviously no one had a clue what a Badmarsh general or badmarshal should look like. When we again engage our traditional dushman, the Fantasians, Captain Critchley's jack boots will stomp the stage once more.

We were tremendously lucky with the weather, which was especially important on the second day which was the sort of day when a long-legged colonel from the middle row of chairs is as happy as a short-legged general in the arm-chair front row. The weather at an exercise held in October is as important as it is in Scotland, where traditionally the natives never greet one another without some reference to it, generally in terms of masterly understatement, nicely parodied in "Highland Lament" (*Punch*, 23rd October, 1957) by H. F. Ellis, who would have enjoyed the remark made to me during the South Uist Highland Games in the pre-intercontinental ballistic missile era. It had rained in solid sheets from 9 a.m. till 3 p.m. when the sun shone on the white sands and green machar and we piping judges stood around gently steaming and wondering if our kilts would fall off from sheer weight of water. An aged inhabitant remarked, "A grand day for the games—but it was a pity about that shower."

I have already said a bit about Automedon's main theme. In an already overworked metaphor, the New Look, Medical Sputnik I, its re-animating task fulfilled, has now disintegrated. It was doomed when the division ceased to be the basic formation with a fixed establishment. Field Medical Company Training, Medical Sputnik II, wisely set not so distant in space, is still orbiting at a fine speed visible to the naked eye at all levels. It is to be hoped that a method can be found to maintain its progress without the periodic discharge of rockets. We have not yet reached the moon. The medical company will eventually be integrated into a sound field medical organisation and the training must be integrated into the normal progression of Corps Training. It is quite obvious that a field force could never be fully insured against the present threat of mass casualties without unacceptable additions to its administrative tail. To commanders and staff the needs of the medical services in manpower and material in this nuclear-armed age must seem insatiable. The present training drive manifests to them that we are determined to do the mostest with the leastest. Existing units have been made fitter for their possible tasks, but staff officers must never be allowed to forget that trained medical manpower can only develop its full potential in life-saving treatment if they are relieved of as much as possible of the man-handling tasks of collection, transportation and, if necessary, decontamination of mass casualties.

Great enthusiasm and interest have been aroused, and much really hard and profitable work has been done, for which, if it is fair to single out anyone for praise, we might thank especially our always hard-worked sister tutors.

Whatever may have been the name of the dog in the second Russian sputnik, the answer to our own is certainly not a lemon. So, as in travelogue mood we wended our unwilling way to the vehicles waiting to bear us swiftly from Mytchett, a haunting evocation of the spirit of Tir nan Og, the land of youth, fell faintly on our enchanted ears, as through the golden autumnal haze sounded the clear notes of "Will ye no come back again" played by Piper Blair on the island in the near-by loch—that miniature Hebridean haven set in the heart of hoplitic Hampshire. (I hope Automedon will accept the validity of that last adjective, meaning "teeming with soldiery.") Of course, I know that there is no island in Mytchett Lake, but no doubt by next year there will be one, probably complete with a ruined castle and a legend of the imprisonment there of Sir James McGrigor, in about his thirty-fifth year of office, by a dissident clique of promotion-happy Inspector-Generals.

After Deucalion and Automedon, I feel that the Field Training Centre can do almost anything.

REFERENCE

- (1) *The Creevey Papers, Vol. I, p. 237.*

CIVIL AFFAIRS—PORT SAID—1956

BY

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DURING the recent Anglo-French operations in Egypt, the author was one of the public health officers of the British Civil Affairs Unit which ran the administration of Port Said for six weeks. The unit landed on 10th November, three days after fighting had ceased. Before its arrival, Lieut.-Colonel F. J. Hooper, R.A.M.C., controlled public health activities, on instructions of D.D.M.S., 2 (Br.) Corps. He gave us a "flying start" with a comprehensive appreciation of the situation, and introductions to the appropriate Egyptian officials. It was planned that Public Health, Civil Affairs, would be responsible for running all civilian medical services including hospitals. As more territory came under British administration, so the staff would be increased. At first this consisted of one army health specialist and a chief clerk (Staff-Sergeant, R.A.M.C.). A week later another army health specialist and a R.A.M.C. administrative officer for medical store duties were added.

The limited area and the very early evacuation made even this staff more than adequate. The administrative officer, for example, had little to do with stores, as no Civil Affairs medical store depots were landed. Throughout, a very close working relationship was maintained with D.D.M.S., 2 (Br.) Corps, with mutual advantage.

British Civil Affairs controlled the town of Port Said and the west bank of the Suez Canal for twenty-five miles to El Cap. The French equivalent, the Cinquième Bureau, administered Port Fuad and the east bank. British Public Health ruled indirectly, using the existing Egyptian Public Health and Medical Authorities. This system worked well in spite of a tendency on the part of the Egyptians to "go slow." This was due to fear of appearing too co-operative with us. For political reasons they were loath to accept material help from us direct (except in dire emergency), but took it willingly if passed through a neutral third party such as the International Red Cross.

Situation on arrival, 10th November

Apart from the activities of a few snipers, all fighting had ceased and the process of clearing up had started. The population had been slightly reduced to about 150,000, as many better-class people and much of the unskilled labour force had left.

Material damage was slight except where the Egyptian Army had put up determined resistance, such as at the Governor's Palace and the former British Navy House. A small part of the Arab quarter had been destroyed by fire, rendering a number of people homeless. Water mains, power lines, and sewers had suffered severely, though luckily both waterworks and power station were

intact. Even so, at this early stage the Royal Engineers had succeeded in providing water for six hours a day. Most of the dead had been removed to the cemetery where burial was in progress. A large number of dead animals remained untouched on the outskirts of the town. In the streets lay large piles of uncleared refuse which were breeding millions of flies. No epidemics had been reported, though it was known that dysentery and enteric were endemic; in addition, thirty cases of enteric had fled from the fever hospital during hostilities and had disappeared. No cases of the International Convention diseases such as plague or smallpox were known to exist. Hostilities stopped all hospital and out-patient services except the treatment of casualties and surgical emergencies.

The specialist hospitals for fevers, tuberculosis, and ophthalmology were all in the path of the fighting and had been precipitately evacuated by staff and patients with great loss of movable stores such as bedding. Except for the fever hospital (mortared by the Egyptians), buildings were intact. Casualty treatment centred on two general hospitals, both of which were undamaged. Their capacity had been expanded for the emergency from 350 to 600 beds, with small additions of staff. In spite of this, one hospital was nearly overwhelmed by a combination of casualties and interruption of essential services and food. With few exceptions such as morphine, blood, plaster of Paris, and dressings (all supplied by us), medical supplies were adequate for immediate needs. Food distribution had broken down; this, with withdrawal of the police force, had led to looting which was now under control. Remaining stocks of food in the town were adequate though the importing of fresh meat and vegetables from the Nile Delta and sea fishing had ceased.

Action taken to safeguard the health of the population

Priority was given to five main problems. These were :

1. Restoration of public utilities.
2. Removal of street refuse.
3. Essential services and supplies for hospitals treating casualties.
4. Care of the homeless and destitute.
5. Disposal of the dead.

Next in order of importance came :

6. Epidemic prevention measures.
7. Provision of medical supplies.
8. Importation of fresh food.
9. Restoration of normal hospital and out-patient services.

The handing over to the United Nations' Expeditionary Force (U.N.E.F.) precluded further development of civilian health services. British Civil Affairs then arranged the evacuation of British and foreign nationals, and dealt with problems associated with the British withdrawal.

In the restoration of public utilities, Public Health's main problem was to

achieve a safe water supply. This was done by raising the chlorine dosage at the waterworks until free chlorine could be regularly demonstrated at all distribution points. This required a dosage of 2.5 parts per million, a high dose for a modern plant. Two factors which affected the quantity of water available are of interest. Port Said's water supply comes from the Nile via the Sweetwater Canal which terminates in the waterworks just south of the town. Early on it was observed that the water level in the canal was abnormally low for the time of year. Investigation showed this to be due to two causes. Reeds in the canal (normally cleared every autumn) were impeding the flow of water, and there was an artificial breach in the canal near Egyptian-held Kantara. The latter was probably made accidentally when the Egyptian Army cratered the Suez Canal road running between the Sweetwater Canal and the Suez Canal, thus allowing fresh water to leak into the Suez Canal. It was soon repaired on representations being made to Cairo through the United Nations. Restoration of Port Said's system of sewers was difficult owing to their archaic design, but the service was almost back to normal in six weeks. The billeting of relatively large numbers of soldiers in civilian houses caused difficulties over latrine facilities, especially as the obvious alternative of deep trench latrines was impracticable because of high subsoil water. Bucket latrines emptied direct into the sewage works were used.

In the streets piles of uncleared domestic refuse which were breeding flies provided one of the major menaces to health. As a preliminary measure the streets were dusted with 5 per cent Gammexane powder and then gradually cleared. Some delay in clearance was experienced as labour was afraid to work at first and all refuse lorries had disappeared, either captured by us or leaving with the retreating Egyptian Army. A scratch fleet of refuse lorries and other captured transport was therefore assembled and released to the town authorities. Military refuse created no difficulty because units used the controlled tip which was well outside the town, except during the withdrawal when it was dumped at sea.

The major needs of hospitals treating casualties were restoration of all public services (water, sewage, electric light) and resumption of regular food supplies. They were given priority for these services which were soon functioning normally. In addition an emergency electric generator was installed in the largest hospital. On 12th November the number of patients was reduced by about one-third, 190 Egyptian service wounded being evacuated by ambulance train to Cairo under arrangements made by the D.D.M.S., 2 (Br.) Corps. This enabled the hospitals to reorganise rapidly before reopening for normal admissions. These and out-patient clinics started twelve days after the cease-fire, the only limitation being fifty beds reserved for emergency purposes. Out-patient clinics for tuberculosis and ophthalmology were started as a preliminary to the reopening of their specialist hospitals, though lack of equipment delayed this until after the Anglo-French withdrawal.

There was no major shortage of medical stores. At first essential items such as morphine, blood, plaster of Paris, and dressings were obtained from British medical units. Later, supplies were sent up from Cairo through the International

Red Cross. Civil Affairs was provided with a medical store depot, but this was not landed as it arrived too late. Apart from this, we made available large quantities of T.A.B.T. vaccine and dried calf lymph for the civilian population. Civil Affairs supplies of insecticides and sprayers also arrived too late. Luckily Port Said is the main insecticide depot for the whole Suez Canal Governorate, stores including over 20 tons of 5 per cent Gammexane in talc (used as an all-purpose insecticide dispersed either by Dobbin duster or hand). In addition, Civil Affairs was able to obtain small quantities of insecticides and sprayers from commercial houses for army use until army supplies were landed.

British regimental medical officers and 15 Field Ambulance, R.A.M.C., answered numerous sick calls from the civil population, especially after curfew at night when civilian doctors and ambulances would not go out. This service was much appreciated by the local population.

Two types of case caused major administrative problems. These were mental cases and persons requiring anti-rabic treatment, both of which were normally treated in Cairo. This procedure was continued, though requiring lengthy negotiations through United Nations.

Care for the destitute fell into two categories. Firstly there was the foreigner resident in Port Said out of work through the Canal being closed, or unable to draw money from the banks as accounts were frozen. He required food and this was provided by the churches and foreign consuls working with Civil Affairs and the Egyptian controller of food supplies. The Egyptian problem was greater as many needed both accommodation and food, and were generally the poorer class of people. Relief work was initiated by a committee of notables of Port Said who soon handed over to the International Red Cross, Civil Affairs, and the Egyptian Ministry of Social Affairs. 2,400 were accommodated in schools and empty houses, and 6,000 were given two meals daily. Public Health kept a careful watch on health; T.A.B. inoculation, anti-typhus dusting, and daily health checks were carried out. Some attempt was made to provide a hygienic environment, with latrines, water points, insecticide spraying and refuse collection, but this was not entirely successful in view of the low standards of hygiene of many of these people. It was interesting to note that on the average each family had seven children.

Burial of the dead was almost complete when Civil Affairs arrived, though much reburial from shallow graves and the Suez Canal had to be done. This was carried out by the Egyptian Public Health Department. Registration of the dead broke down early in hostilities. This permitted Cairo Radio to make extravagant propaganda claims as to the thousands of Egyptian killed and wounded. No fewer than four high-level inquiries were made as to the number of casualties, the last being that of Sir Edwin Herbert, President of the Law Society. This was, of course, followed by Dr. Summerskill's visit after we had left Port Said. The moral would seem to be to register the dead at the time. Disposal of dead animals was much more difficult. Carcasses were grouped together and burnt, close supervision being required to ensure complete combustion.

Epidemics were the next consideration. Enteric and dysentery were thought

to be the most likely dangers as both were endemic. Normally enteric becomes epidemic in Port Said during the summer months, up to 200 cases a month being notified, though the true incidence is thought to be higher, many cases being treated privately at home. The predominant organism varies from year to year, that of 1956 being *Salm. paratyphi B*. A campaign for T.A.B. inoculation of the civilian population was therefore initiated, concentrating first on those such as the destitute who were thought to run the greatest risk. Anti-typhus dusting of the population in the Arab quarter was also carried out. A smallpox vaccination programme was planned but not commenced before the Anglo-French withdrawal. The appearance of dead rats in the streets prompted examinations for plague which proved negative.

Two wooden huts holding fourteen beds were set aside as a temporary fever hospital. Two schools and the new jail (empty but capable of taking 500) were also surveyed for emergency use. A small tented hospital on the site of the former fever hospital was planned for highly infectious cases such as smallpox. As it turned out, these preparations were unnecessary as no epidemics occurred. Only two cases were admitted to the fever hospital, a severe case of measles and a suspected enteric which later proved negative.

Because Port Said produced no food of its own, ensuring adequate food supplies was a major part of Civil Affairs responsibility. A food ship lay off Port Said to land supplies immediately local stocks were exhausted. These reserves were adequate and lasted throughout the occupation. Sea fishing and the importing of fresh meat and vegetables from the Nile Delta were permitted in spite of the serious risks to our security. Shortage of kerosene (the only fuel used in Port Said) caused some anxiety, but sufficient supplies were always maintained.

Hand over to U.N.E.F. and withdrawal

The announcement that the British and French were to evacuate Port Said was greeted with great enthusiasm by the local population. The Egyptian underground army began a campaign of grenade throwing and sniping. Egyptian public health officials became full of energy and required little if any help from us. British Civil Affairs handed over responsibility for public health to U.N.E.F. on 13th December. It then concentrated on the evacuation of British and Italian nationals (about 700 of each) with their not inconsiderable baggage. Each group had a small number of sick and infirm requiring special care in embarkation. 15 Field Ambulance vaccinated over 400 British nationals. The British Army's evacuation was conducted by phases, by withdrawing inside smaller and smaller barbed wire perimeters. U.N.E.F. took over the evacuated areas and acted as a cushion between ourselves and the Egyptians. Arrangements were made for civilian doctors inside the perimeter to be available during the day, whilst 15 Field Ambulance and a surgical team were on call at night. Egyptian civilian ambulances were given free access to remove cases to hospital (all civilian hospitals were soon outside our perimeter) but would only do so after considerable pressure from U.N.E.F. Similarly, in spite of promises to U.N.E.F.,

Egyptian street-cleaning squads would not work in British-controlled areas. This led to some accumulation of refuse in the streets before the evacuation was complete.

Conclusions

In some respects the work of Public Health, Civil Affairs, could have been made more effective. The public health section should, I think, have landed earlier and commenced work immediately the fighting had ceased. When the taking over of a dirty town (as was Port Said) is envisaged the early employment of a Field Hygiene Section is essential. This section should work in close co-operation with Civil Affairs. The earlier employment of such a section in Port Said would have reduced the fly menace and the dysentery problem amongst troops. The medical stores needed for Civil Affairs differ from their military counterpart in that more antibiotics and vaccines are required. It is suggested that the problem merits further detailed study. Both medical and sanitary stores should be landed earlier, part to come in with the Advance Party and the remainder within fourteen days. The establishment of Public Health, Civil Affairs, omits sanitary inspectors. The Port Said operations showed this to be a serious defect. They would prove invaluable in clearing up a disorganised town. The representative of the International Red Cross originally came to watch over the interests of Egyptian prisoners of war in our hands. He did much more than this, co-ordinating welfare and relief measures and acting as a very able intermediary between us and the Egyptians. His presence was a decided asset ; the International Red Cross should be invited to send such a representative under similar circumstances in the future. In view of the trouble in Port Said, some attempt should be made to register the dead. This should be part of normal Civil Affairs duties and not a medical preserve.

British Civil Affairs finally closed down on 19th December, embarking for home the same day, after six weeks' work. By this time there had been no epidemics, the health of the population had been maintained at a high level, food was adequate, the destitute were housed and fed, general hospital and public health services were re-established, a start had been made on the more specialised medical services such as tuberculosis, the water supply was safe and adequate, refuse collection and street cleaning were satisfactory, and sewage disposal almost normal. No mean achievement !

AN UNUSUAL CASE OF EPITHELIOMA ADENOIDES CYSTICUM

BY

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EPITHELIOMA adenoides cysticum (Syn. Multiple benign cystic epithelioma, tricho-epithelioma, Brooke's tumour) is a tumour of the skin appendages showing differentiation towards hair structures (Lever, 1954). This benign condition is frequently hereditary and often manifests itself at the age of puberty (Ormsby & Montgomery, 1954). The lesions, which are commonly small, are usually confined to the face, but are occasionally found on the neck, arms and upper extremities.

We describe below a case with typical lesions on the face, with slightly larger lesions on the back and with the unusual feature of subcutaneous nodules on the trunk.

CASE REPORT

The patient, a 20-year-old soldier, reported sick in April, 1956, while serving in Japan. His story was that he had had warty growths at the side of his nose "for as long as he could remember." Over the past few years fresh lesions had been appearing on the eyelids, forehead and temples, and while serving in Korea the lesions had been itchy. He also had scattered nodules on his back, but these had not increased in size or number.

Three months prior to reporting sick he noticed three subcutaneous swellings—one on the right thigh, one on the right flank and one just above the outer end of the right clavicle.

Just before joining the army in mid-1955 a nodule on the side of his nose had been removed (first biopsy), but he did not know the result of the examination of this other than that further treatment was not required or suggested at the time.*

His general health was good and he had not had any serious illnesses. He reported that his father, one paternal aunt, grandfather and possibly his great grandfather had also had similar facial lesions, but that his brother and sister were unaffected.

* We have been informed by Dr. E. Ritter, of County Hospital, Lincoln, that this was reported as typical epithelioma adenoides cysticum.

One of the nodules at the side of the nose was removed in Japan (second biopsy). A tentative diagnosis of rodent ulcer was made and he was invalided home for further treatment.

On arrival in this country examination revealed in each naso-labial groove a cluster of papillomatous excrescences covered by unbroken, smooth, red and shiny skin. The lesions were rounded except for one or two which were larger than the others and formed horn-like projections. Small domed papules, mostly about the size of a pin-head or a little larger, were present in the skin of the eyelids, the front and sides of the forehead, and there were also a few about 3 mm. in diameter in the scalp. In the middle of the upper part of the back there were several discrete papules, 2-10 mm. in diameter, covered by red, smooth skin.

The subcutaneous swellings noted by the patient were all firm, discrete and ovoid, measuring approximately 2 cm. by 1.5 cm. They were attached to the deep surface of the skin and were freely movable with the skin on the deep fascia. A fourth nodule similar to the others, but not noted by the patient, was found over the inferior angle of the left scapula. The skin overlying the swelling above the right clavicle was bluish and did not blanch on pressure, while the skin over the others appeared normal. In addition there were a few bluish papules, 1 mm. in diameter, scattered over the trunk.

In May, 1956, one of the papules on the back and the swelling above the right clavicle were excised (third biopsy). The supra-clavicular nodule was attached to the deep surface of the skin but was easily removed intact.

PATHOLOGY

Two specimens were received from the third biopsy (May, 1956).

Nodule from back. An ellipse of skin 2 cm. by 1 cm. bearing in the centre a sessile elevation 1 cm. in diameter by 0.6 cm. in height. On section the centre of the raised area was found to consist of dark yellowish tissue which extended downwards through the corium to the subcutaneous fat. The edge of the lesion was clearly defined but irregular in outline.

Nodule above clavicle. A firm smooth bean-shaped encapsulated nodule 2.0 cm. by 1.5 cm. by 1.0 cm. The cut surface presented a uniform, almost white appearance.

Sections of the first and second biopsy were also available for study.

Microscopically all biopsies show the typical histological picture of epithelioma adenoides cysticum. In the naso-labial folds continuity between the basal layers of the epidermis and the underlying lesion is obvious, but in the papule from the back no direct connection between the epidermis and tumour can be demonstrated although the superficial margin of the lesion lies close to the epidermis. No epidermis is present in the supra-clavicular nodule which consists of tumour surrounded by a thin capsule of compressed collagen fibres. The tumour itself in all sections consists of a fibrous stroma separating interlacing strands and irregular islets of basal cells in which the characteristic horn cysts can be seen (Figure 1).

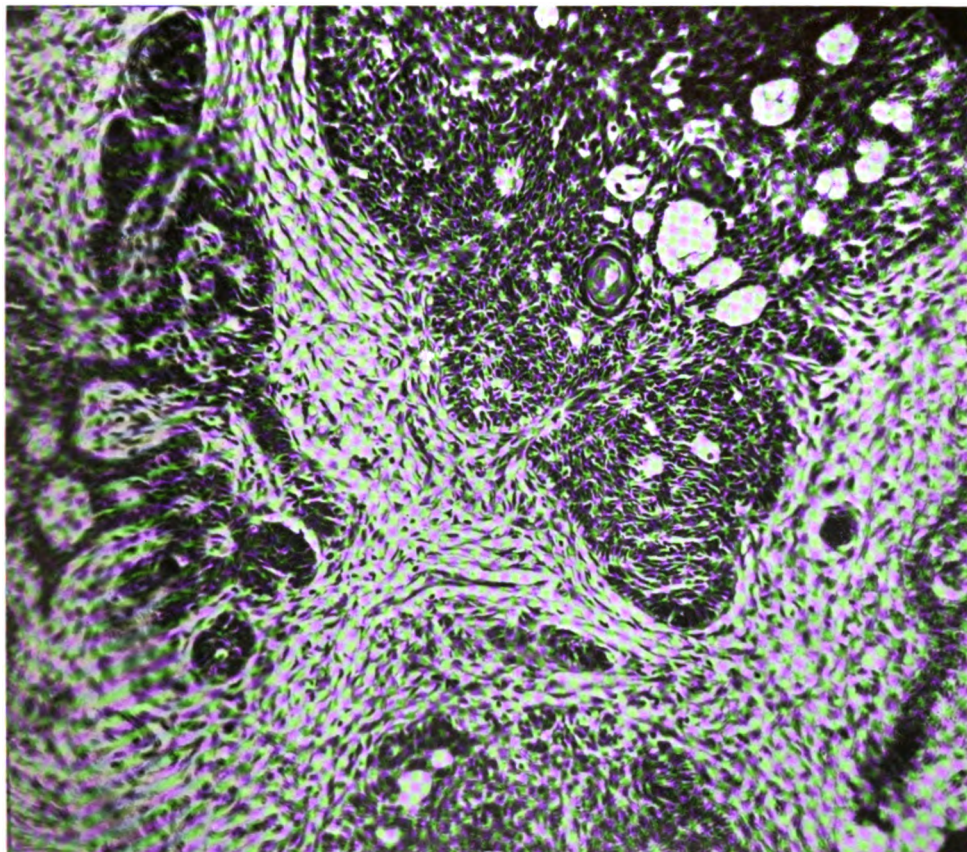


Fig. 1. Section of supraclavicular nodule showing typical structure of epithelioma adenoides cysticum. One horn cyst can be seen.

TREATMENT

The patient was referred to Mr. Clarkson, of Guy's Hospital, for treatment. Wire brush abrasion of the facial lesions was carried out with a satisfactory cosmetic result.

We are grateful to Dr. E. Ritter for sections of the first biopsy, and to Colonel K. McNeill and Dr. H. Haber for advice.

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THE TOXICITY OF INTRACUTANEOUS T.A.B. VACCINE

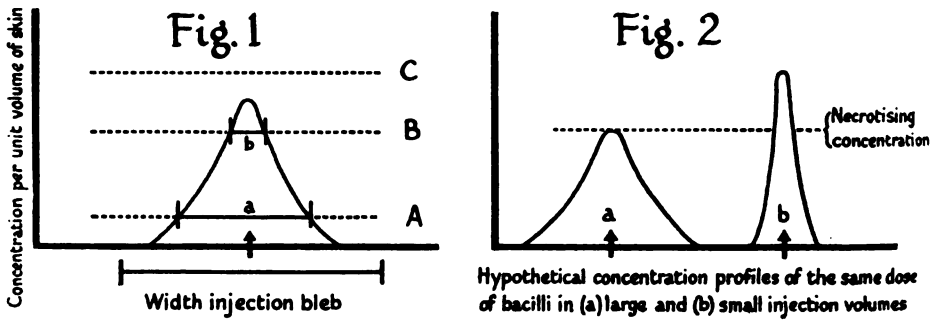
BY

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INTRACUTANEOUS inoculation with bacterial antigens appears in some circumstances to be simpler and more efficacious than inoculation by other routes. In procedures like anti-typhoid inoculation, however, the substitution of the intracutaneous for the subcutaneous route of injection raises a number of difficulties. If bacillary suspensions of the concentrations routinely used for subcutaneous inoculation are employed, either 0.5 and 1.0 ml. volumes must be injected intracutaneously to maintain the standard dosage—a time-consuming and perhaps painful operation—or a smaller dose of bacilli given, such as that contained in 0.1 or 0.2 ml.

The routine dosage can be accommodated in the appropriate intracutaneous volume by using more concentrated bacillary suspensions. One of the characteristics of intracutaneous injection, however, is the accumulation of the injected material round the tip of the needle, because both soluble and particulate substances (e.g. toxins, tuberculin and bacteria) are adsorbed to the tissues or are otherwise fixed, so that they do not necessarily spread evenly with the injection fluid to the limits of the injection bleb. It is a commonplace of intracutaneous titrations in animals that the reaction is most severe, often ending in necrosis, at the centre of the inflamed area, and diminishes as the periphery is approached. Clearly the injected material is either mechanically held in the interstices of the tissues near the needle point, or preferentially adsorbed to them, thus producing a humped "concentration-profile." The hump may be steep; for example, the concentration of diphtheria toxin at the centre of a 15 mm. lesion in the guinea-pig is about four times that in the tissues 5 mm. from the centre (Miles, 1949).



The abscissae represent the median cross-section of the injection site and the arrows indicate the tip of the needle, from which the injection fluids spread radially

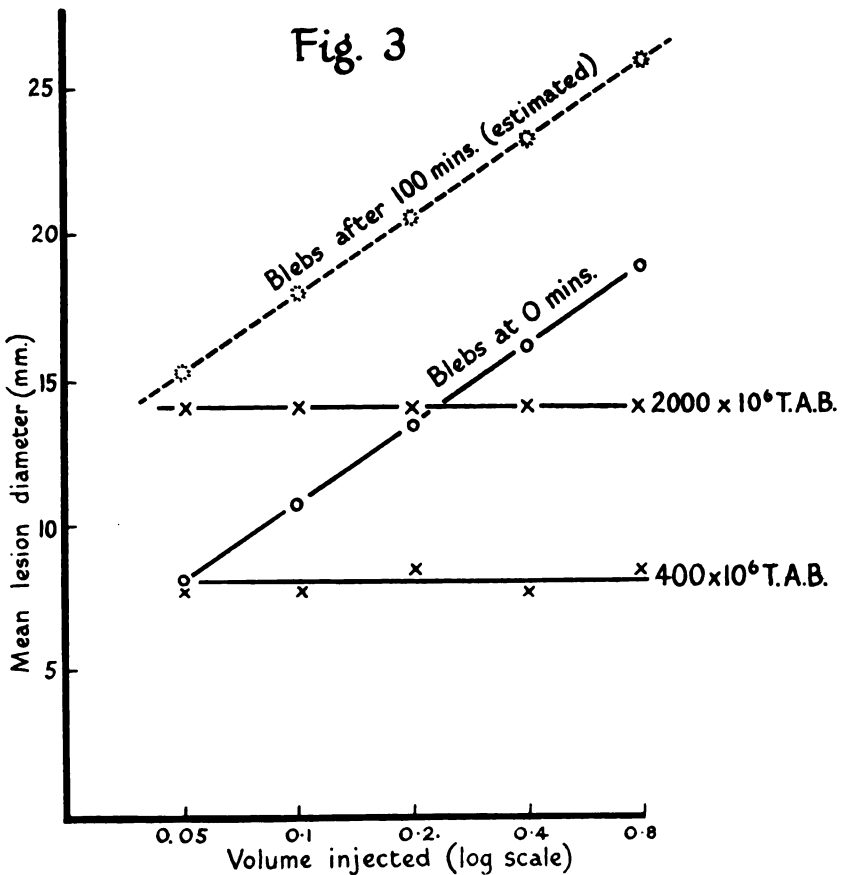


Fig. 1 represents the hypothetical concentration profile of T.A.B. in the median cross-section of the injection-site after intracutaneous inoculation. If A is the concentration of bacilli per unit volume of skin inducing inflammation, the diameter of the indurated area after twenty-four to forty-eight hours will be a ; and if B is the necrotising concentration, this indurated area will have a necrotic patch in the centre, of diameter b . On the other hand, if C is the necrotising concentration, there will be no central necrosis. Intracutaneous injection of T.A.B. in army personnel in 0.1 ml. doses of suspension containing 5×10^9 /ml. does not induce necrosis, but it is of some importance to know when increasingly concentrated suspensions are used whether the concentration profile in the skin becomes taller and sharper (e.g. as in Fig. 2), and whether necrotising levels are achieved in these circumstances.

Using guinea-pig skin as a model for human skin, we can answer these questions by applying the technique of the "constant-dose" titration (Miles & Miles, 1952), testing a fixed number of bacilli in graded volumes of injection fluid.

The curves in Figs. 1 and 2 represent concentration profiles as *finally established*, at an early stage in the process of intoxication that will end in an observable inflammation. Presumably a much steeper profile is established at the time of injection, one which flattens out with subsequent changes in the shape of the injection bleb. In the guinea-pig, the size of the bleb and its subsequent changes are simply, and consistently, related to injection volume, as follows. The "immediate" bleb is raised within a second or so of injection, and its diameter is proportional to the log. volume injected (Fig. 3, Blebs at 0 min.) After this the bleb declines slowly in height and increases in diameter, as a result of continued outward movement of the injection fluid as the distended skin contracts in the direction perpendicular to its surface. The increase in diameter is directly proportional to log. time (Miles & Miles, 1952). Thus the diameters at 0 min. have increased after 100 min. to those indicated by the dotted line in Fig. 3.

MATERIALS AND METHODS

The test inocula were prepared from a thick T.A.B. suspension of killed organisms in 0.5 per cent phenol, kindly supplied by Colonel M. H. P. Sayers. It contained 52×10^9 bacilli per ml., according to the "old" Brown standard, and was diluted as needed in 0.85 per cent saline. Two levels of "constant-dose," 400×10^6 and $2,000 \times 10^6$, were tested in graded volumes of saline, as follows:

Volume injected (ml.)	Bacterial Concentration (millions/ml.)	
	Series 1	Series 2
0.05	40,000	8,000
0.1	20,000	4,000
0.2	10,000	2,000
0.4	5,000	1,000
0.8	2,500	500
Constant dose	$2,000 \times 10^6$	400×10^6
Total dose/animal	$10,000 \times 10^6$	$2,000 \times 10^6$

The ten injections comprising series 1 and 2 were made into the dorsal skin of the trunk of three depilated albino guinea-pigs. The diameter of the bleb raised immediately after injection, and that of inflammation and necrosis after twenty-four hours, were recorded, and the mean lesion-diameters plotted against log. volume injected (Fig. 3). None of the animals suffered any general intoxication from the total of $12,000 \times 10^6$ bacilli it received.

RESULTS

The diameter of the injection bleb immediately after injection is proportional to log. volume, the 0.05 ml. bleb being 8.0 mm. and the 0.8 ml. bleb 19 mm. in diameter (Blebs at 0 min., Fig 3). The diameter of the resulting inflammatory reactions, on the other hand, is independent of the volume injected, the 400×10^6 bacilli inducing a lesion of about 8 mm. in diameter, and the $2,000 \times 10^6$ a lesion of about 14 mm. The larger dose induced central necrosis, and this response was the only feature of the lesion to show a volume effect—though only a small one. With the 0.05 ml. volume, the necrosis was 3 mm. in diameter, and declined with increasing volume to 1.7 mm. with 0.4 ml. and 0.8 ml. The mean diameter was 2.4 mm.

The experiment was repeated with constant doses of $1,000 \times 10^6$ and 200×10^6 . The results were substantially the same, except that the lesion-diameters were not quite independent of the volume injected. At each level of the response, the 0.05 ml. injection induced a lesion whose diameter was about 1 mm. less than that induced by the 0.8 ml. injection. There was no central necrosis.

DISCUSSION

The events of the 0.05 ml. injection of $2,000 \times 10^6$ are presumably as follows. Some of the bacilli remain in the area of the "immediate" bleb, but there is an excess which, when carried out with the subsequent outward extension of saline, is sufficient to intoxicate to the 14 mm. limit. In a 0.8 ml. volume, $2,000 \times 10^6$ bacilli are again sufficient for fixation in an area 14 mm. in diameter, but they are carried there during the second or so of the actual injection. The bacilli in the intermediate volumes are, according to the volume, distributed partly by the quick outward flow at injection, and partly by the slower flow after injection. That is to say, the effective concentration profile of intracutaneously injected T.A.B. vaccine, owing to the continued outward movement of injection fluid, is established definitively some time after the injection; so that over a sixteen-fold range of volumes, its distribution is virtually independent of the injection-volume—*i.e.*, the event postulated in Fig. 2 (*b*) does not take place.

The size of the area of inflammation is determined mainly by dose. The mean lesion-diameters (in mm.) of the four doses tested (combination of two tests) were :

	Dose (millions)			
	200	400	1,000	2,000
Induration	6.5	8.1	10.1	14.1
Necrosis	0	0	0	2.4

The minimal necrotising dose of this vaccine is somewhere between $1,000 \times 10^6$ and $2,000 \times 10^6$; and $1,000 \times 10^6$ was subnecrotising, even when given in a volume of 0.05 ml.—*i.e.*, in a concentration of $20,000 \times 10^6$ /ml.

CONCLUSION

It appears that, provided the dose of T.A.B. bacilli is about half the minimum dose inducing necrosis at the centre of the injection site, it can be as safely injected in a 0.05 ml. volume as in a volume of 0.5 ml. or greater.

In their response to a wide variety of injected substances, including those which induce acute inflammatory induration, the skin of the guinea-pig, rat and rabbit behave very similarly, in spite of some pronounced differences in structure. Since there is no reason to suppose that human skin does not share the properties common to the skin of these animals, the results with T.A.B. vaccines in the guinea-pig are *prima facie* evidence that doses of T.A.B. which are subnecrotising in man in relatively large injection volumes would be no more toxic if given intracutaneously in small volumes.

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ACUTE SPINAL EPIDURAL INFECTION

REPORT OF AN ILLUSTRATIVE CASE

BY

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PYOGENIC infection occurring in the areolar tissue surrounding the dura of the spinal canal is recognised as an important, and not very rare, clinical entity. Few text-books, however, give more than meagre consideration to the condition, and their descriptions fail to emphasise the frequency with which a uniform sequence of symptoms and signs occurs; nor do most lay sufficient stress on the importance of early recognition and the great urgency for treatment.

Hulme & Dott (1954) recently described a series of 25 cases of spinal epidural suppuration, 19 of which had been treated in the Department of Surgical Neurology, Edinburgh Royal Infirmary, between 1933 and 1952. In their experience, "the most important factor in early diagnosis is an awareness of the possibility of the condition, and an appreciation of the rapidity with which the pathological process advances to an irreversible state." The subject is reviewed in several excellent papers from North America (Boharas & Koskoff, 1941; Gasul & Jaffe, 1935; Grant, 1945; Heusner, 1948; Rankin & Flothow, 1946), and all writers exhort early recognition of the condition which, they stress, is

the most important factor in influencing its outcome. Grant (1945) attributes improved results in recent years to earlier treatment, made possible by publications to acquaint the medical profession with the urgency of these cases, and he considers that delay in diagnosis is more often due to failure to give it consideration than to any other cause. Other contributors of single case reports similarly plead for a wider familiarity with the condition.

Individual experience of an entity such as spinal epidural abscess is inevitably limited, and unless a case has been witnessed previously, there is a real danger that its full implications may not be appreciated immediately. Heusner (1948) reports on 20 consecutive cases of non-tuberculous spinal epidural infection treated in the Department of Neurosurgery, Boston City Hospital, between 1930 and 1948. In none had a diagnosis of epidural abscess been ventured before hospital admission. At the time of admission, 19 of these patients had neurological changes in the lower limbs, ranging from weakness to complete paralysis.

There is therefore justification for recording a case that illustrates the clinical features of the condition, and in which early treatment was followed by a satisfactory result.

CASE REPORT

A private in the W.R.A.C., aged 21, who had been employed on transport driving duties, was admitted to the Royal Air Force Hospital, Cosford, in May, 1956, with the presenting symptom of pain in the back, first experienced three days previously. The intensity of the pain had gradually increased, and was felt as an unremitting severe ache, just to the right of the midline at the level of the first and second lumbar vertebrae. There was no "girdle" or longitudinal radiation. She walked normally, but she volunteered that movement, particularly bending forwards, aggravated the pain. Lying still on her back afforded no relief, and even small movement to alter her position resulted in unpleasant exacerbation of the pain.

There was no history of recent trauma or notable previous illness. It was, however, later elicited that the patient had suffered a small boil on the face about two weeks before, considered by her to have been of trivial significance.

At the time of her admission to hospital she had no headache or other constitutional disturbance, and she was afebrile. Pain, unrelieved by simple analgesics, was the only feature. Examination at this time threw little further light on the condition. There was no local tenderness over spinous processes, and a full range of movement of the trunk was possible, though resented. No neck stiffness was present, but a slight limitation in straight leg raising was noted. Further examination was negative, special attention being paid to the central nervous system, which appeared intact.

Investigation showed a total white cell count of 10,400 per c. mm. (neutrophils 73 per cent, monocytes 4 per cent, lymphocytes 22 per cent, eosinophils 1 per cent and E.S.R. (Westergren) was 23 mm.). The urine was sterile. No abnormality was detected in radiographs of the chest and lumbar spine.

The pain continued unabated and its situation remained unchanged. On her third day in hospital she ran an intermittent fever, the chart on succeeding days showing high "spikes" with recordings up to 105° F. Concurrently, a polymorphonuclear leucocytosis developed, with a rise in count on each successive day. On her seventh day in hospital the total white count was 18,500 per c. mm. of which 83 per cent were neutrophils.

Pain, continuous and localised to the right upper lumbar region, remained disproportionate to malaise or other general symptoms. The swinging fever and leucocytosis suggested a pyogenic infection, and perinephric abscess or a retroperitoneal collection of pus were entertained as possibilities. On the fourth day, crystalline penicillin, 500,000 units six-hourly, was started, but no improvement occurred during the next two days. The pain was by now of an extreme order of severity, such that opiates afforded only slight alleviation.

Blood cultures had been set up before starting antibiotic treatment. *Staphylococcus aureus*, coagulase positive, was grown in three out of the four cultures that were incubated. Erythromycin, 500 mg. six-hourly, by mouth, was substituted for penicillin as soon as it was known that this was the only antibiotic tested to which this organism was very susceptible.

On her seventh day in hospital (ten days after the initial symptom of pain had been experienced) she developed retention of urine and needed to be catheterised. By now straight leg raising was not possible beyond 40 degrees, and considerable muscular spasm made "knee-kissing" impossible. There was no local swelling or redness, but percussion over the region of the eleventh and twelfth thoracic and first lumbar vertebræ now caused pain. Twelve hours later she noticed a heavy feeling in the legs, and examination then revealed bilateral weakness of the lower limbs and sensory deficiency, in the form of hypalgesia over the first and second sacral segments. The knee jerks were symmetrically depressed, ankle jerks could not be elicited, and plantar responses were flexor. Unequivocal signs of spinal compression were now present, the evidence suggesting pressure over the cauda equina.

Lumbar puncture was done cautiously at lumbar 4-5 level, slight negative pressure being applied as the needle was advanced. No pus was withdrawn overlying the dura, but deeply xanthochromic fluid was obtained from the subarachnoid space. Manometry showed a pressure of 30 mm. and no rise followed bilateral jugular vein compression. The specimen contained 40 cells per c. mm., predominantly lymphocytes, and the protein content was greatly increased to 1,300 mg. per 100 ml.

The patient was immediately transferred to the Department of Neurosurgery, Queen Elizabeth Hospital, Birmingham, under the care of Professor Brodie Hughes, where lumbo-dorsal laminectomy and evacuation of an epidural abscess were carried out soon after her arrival (Mr. E. J. Newton).

The account of the operation reads as follows :

"A linear incision was made from T.11 to L.1 vertebræ and the sacro-spinalis muscles stripped on each side. The spines and laminae of these vertebræ were then removed. In the upper part of the wound an encapsulated epidural abscess was

encountered and ruptured while removing the laminae. A considerable amount of thick pus escaped. In the lower part of the wound the abscess continued as a granulomatous mass gradually merging into normal epidural tissue. As pus was still running into the wound at the upper end of the exposure, the incision was continued upwards and laminectomy of T.10 vertebra was done. A further quantity of pus was evacuated and the right lamina of one vertebra, probably T.11, was necrotic and apparently the site of osteomyelitis. It was felt that the upper end of the infective process had now been reached and that the conus medullaris and upper cauda equina had been satisfactorily decompressed.

"The wound was sutured in three layers, with a rubber drain at each end of the epidural space."

Post-operative progress was entirely satisfactory, with return to normal of power, sensation, and bladder function. Erythromycin was continued for ten days following the operation. A month later she had neither symptoms nor neurological deficiency. Radiography of the dorso-lumbar region at this time showed a laminectomy defect, but no evidence of osteomyelitis.

DISCUSSION

Ætiology

Staph. aureus is by far the most common organism responsible for acute spinal epidural infection. Many case reports clearly show the derivation of epidural abscess by hæmatogenous metastasis from such a primary source as a furuncle, acne, cellulitis, or pyelitis. In a series of 18 cases seen at the Department of Neurosurgery, Queen Elizabeth Hospital, Birmingham, all save one provided evidence in the history of a preceding staphylococcal infection (Hughes, 1957). That apparently trivial superficial skin infection may be culpable is borne out by the present case. The systemic aspect of the condition is illustrated here by positive blood cultures, and the value of these should be recognised as providing early information on the organism's sensitivity to antibiotics.

Anatomy

Dandy (1926) provides practical information on the anatomy of the epidural space. It lies almost entirely posterior and posterolateral to the cord and extends to surround the nerve roots. There is no intracranial extension, the dura being firmly adherent to the foramen magnum. In the cervical region the space is only potential, which accounts for the comparative rarity of epidural abscess in this site, and its invariable association, in the reported cases, with underlying osteomyelitis of the vertebræ. In the thoraco-lumbar region the space is filled with loose areolar tissue and there is very little resistance to the axial extension of pus.

Pathology

The importance of hæmatogenous spread of infection from a primary source has been emphasised, and illustrates the particular affinity for metastatic invasion of loose areolar tissue by staphylococci. Vertebral osteomyelitis is a frequent finding at operation, and almost certainly represents extension of infection from the epidural site, rather than vice versa. Much less commonly, lymphatic spread to the epidural space may occur from a paraspinal lesion, such as a retro-

pharyngeal abscess or mediastinal infection. Penetrating wounds and faulty asepsis in lumbar puncture provide rare examples of infection by direct inoculation. Whatever the mode of infection, and whether or not vertebral osteomyelitis is present, the fundamental pathology is the same. Although the strength of the dura prevents the development of leptomeningitis, it has frequently been observed that the severity of the neurological disturbance may be out of proportion to the amount of cord compression. Again, although in most cases once paraplegia begins it is steadily progressive over several hours, in a few it is of cataclysmic suddenness. These features are satisfactorily explained by obstruction and thrombosis of cord vessels occurring to a variable extent in different cases, and representing a critical factor in determining the extent of recovery following operation.

A variable amount of pus and granulation tissue constitutes the area of infection. A rarer and more insidious condition, chronic spinal epidural granuloma, made up of a mass of sclerotic tissue and little or no pus, differs from acute epidural abscess. The distinction is valuable when considering treatment and serves to emphasise that surgical urgency increases with the rate of clinical evolution.

Clinical Presentation

A remarkable constancy in the clinical pattern is a recurring theme in descriptions of collected cases of epidural abscess. Heusner (1948) usefully divides the clinical development into four phases : I, spinal ache ; II, root pain ; III, weakness of voluntary muscles and sphincters, with sensory changes ; IV, paralysis. Superimposed, in variable amount, are the signs and symptoms of unrestrained sepsis.

Pain of an unrelenting and almost unbearable quality, defying morphia (Abrahamson, McConnell & Wilson, 1934) and worse on trunk flexion (Stammers, 1938), is nearly always the presenting feature. Root involvement and reflex muscle spasm are common, reflected by a positive Kernig sign and an increase in pain caused by coughing or sneezing.

There is always a latent period, varying in descriptions from two to forty days but usually about a week, between the onset of pain and the appearance of neurological signs. The interval is, in fact, indicative of extradural, as opposed to intradural, suppuration (Neale, 1936).

Retention of urine is often the first sign of cord compression, and is followed rapidly by paraplegia, commonly flaccid in type. At some stage there is almost always tenderness on percussion of the spine overlying the abscess.

Investigations

The white cell count is useful in providing early evidence of the pyogenic nature of the infection.

Radiology may show vertebral osteoporosis or erosion, but X-ray appearances often remain indistinguishable from normal in spite of the presence of osteomyelitis.

Lumbar puncture is usually the most rewarding investigation. If the path-

ology of the suspected lesion is understood, lumbar puncture is fairly safe, and certainly "any risk is vindicated by the penalties of procrastination" (Heusner, 1948). Withdrawal of pus from the epidural space is, of course, pathognomonic. More commonly the needle is inserted into cerebrospinal fluid, in which a rise in protein sometimes to very high levels, and poor or absent pressure changes on neck vein compression, are the significant observations.

It will be appreciated that the typical clinical features of the condition are of pre-eminent importance, and investigation remains subsidiary.

Treatment

As soon as the diagnosis is established, laminectomy for drainage of the epidural space becomes a surgical emergency, "the recovery of cord function bearing a close relationship to the severity of the neurological deficit" (Hulme & Dott, 1954). The use of an appropriate antibiotic is, of course, important, but remains an adjunct to neurosurgical intervention.

Heusner reports the complete recovery of all patients with paralysis or paresis of less than thirty-six hours' duration in whom laminectomy and drainage were carried out. The total cure with early treatment contrasts with the inevitable sequel of irreversible paraplegia, and death, if referring for neurosurgical management is tardy.

SUMMARY

A case of acute spinal epidural abscess is described to illustrate a definite clinical entity, which merits more frequent consideration.

Diagnosis is primarily clinical and rests upon the recognition of a characteristic, and surprisingly uniform, sequence of symptoms and signs. There is frequently evidence of previous, albeit trivial, infection; a latent period between this and the onset of pain occurs; severe back pain, signs of acute infection and spinal tenderness ultimately develop; a latent period follows before the onset of neurological signs and symptoms; cord damage occurs, which if untreated, soon becomes irreversible.

Treatment is by laminectomy and drainage of the epidural space, an operation of vital urgency. The use of suitable antibiotics is of secondary importance.

I am indebted to Professor Brodie Hughes for permission to use the case record and for very helpful advice.

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MAJOR-GENERAL D. T. RICHARDSON,

C.B., M.C., M.B., Ch.B., D.P.H.

late Royal Army Medical Corps (Retd.)

DAVID TURNBULL RICHARDSON died on 14th September, 1957, at his home at Badachro in Ross-shire. He was born on 21st December, 1886, at North Berwick and was educated at Edinburgh University, where he graduated in 1910. He was commissioned as Lieutenant in the Royal Army Medical Corps in 1912 and was posted to India in 1914. He subsequently served in the Aden Field Force, being awarded the M.C. at the end of the war.

He qualified as a specialist in hygiene after the war and took the D.P.H. in 1923. Then began his fruitful association with E. P. Cathcart, F.R.S., Regius Professor of Physiology in the University of Glasgow. With Cathcart and Captain (later Colonel) W. Campbell, R.A.M.C., he carried out important work on the economic load for the soldier, the results being reported in the *Journal of the Royal Army Medical Corps* in 1923. With the same collaborators, he published studies on muscle activity and the influence of speed on muscle efficiency (*Journal of Physiology*, 1923-24).

This work led to the investigation of the energy expenditure of the British soldier in India, which he carried out at Jubbulpore, again in conjunction with Campbell. Their Report was published in 1927 and brought a congratulatory letter from Sir William Horrocks, who wrote :

"I know I should have been very glad if such figures had been in existence in 1917, when our food supply was running short and Ll[oyd] George's Cabinet made an attempt to cut down the issues to the soldier at home and in France."

Richardson served as Assistant Professor of Hygiene at the Royal Army Medical College from 1928 to 1932 and was one of the few officers to hold both this appointment and subsequently that of Professor. During this time he wrote the *B.R.C.S. Tropical Hygiene Manual*, which was published in 1932. In 1931 he had been awarded the Leishman Prize for his work in military hygiene. He was Assistant Director of Hygiene at the War Office from 1935 to 1938, and in the latter year became Professor of Hygiene.

The Second World War cut short his tenure as Professor and he was appointed D.D.H., G.H.Q., B.E.F., in 1939. In 1941 he became Director of Hygiene with the rank of Major-General and, in the same year, was made K.H.S. He was appointed C.B. in 1945 and, subsequently, Commander with star of the Royal Order of St. Olaf in Norway.

His tenure of the appointment of Director of Hygiene was exceptionally important and was notable for such major advances as the introduction of D.D.T. for service use and of mepacrine for the prophylaxis of malaria. In 1944 he wrote a long paper, "A New Life for the Soldier," which gave his views about what should be done for the soldier of the future. It must have been gratifying to him in his retirement to see fulfilled so much of what he advocated in this challenging paper.

Throughout his career he was a regular contributor to this Journal, which he served as assistant editor from July, 1935 to June, 1939. He had a talent for

sketching and some of his illustrations still adorn the section on plague in the Army Health Museum at the College ; a later creation of his was "Noffy, the anopheline," in a cartoon dealing with the prevention of malaria.

Richardson was a direct and resolute character, a Scot, a lover of his country and the open-air life ; he was a golfer, yachtsman, shot and fisherman. Characteristically, on his retirement in 1946 he made straight for the Highlands. Here he was in his element and only left his home on two or three occasions before his death. Here he made a beautiful and productive garden, rebuilt a ruined cottage and made a road to it. Here he fished and kept two boats tied up in readiness to the pier in front of the house. One who knew him writes :

"A fortunate visitor who timed his arrival well would be regaled with fried haddock or lobster straight from the sea, caught and maybe cooked by the general, this to be followed by strawberries picked fresh from the garden."

It is peculiarly sad that a man who knew so well what to do with his life should have his retirement cut short by death, and the sympathy of all who knew him must go out to his widow.

Brigadier P. J. L. Capon, Q.H.P., Director of Army Health, writes :

"It was with the greatest regret we learnt of the death of David Richardson. It was characteristic of him, but a genuine loss to his friends, that on retirement he should settle in a remote part of his beloved Scotland and busy himself with all the things he had wanted to do—the improvement of his house and garden, his fishing and the cultivation of his deep interest in natural history.

"To those of us who had the privilege of serving with him, his outstanding characteristics were his singleness of purpose, his supreme honesty and his vision, coloured with an impish humour which would appear at the most unexpected times. He held the appointment of Director of Hygiene from 1941 to 1945, seeing the years of endurance pass into the years of victory, and it was during the latter part of this period that the writer served under him. His devotion to his staff was intense, and only last year in a letter he referred to the pleasure it gave him to follow the careers of his 'boys'.

"Richardson was a man who had his own ideas and spoke his mind, but always courteously and with due regard to the views of others. He was always ready to listen and advise on any problems. He was the author or part author of many publications, but among his most remarkable was his 'A New Life for the Soldier,' written and typed in just over seventy-two hours and containing ideas which were then visionary but have since come to be accepted as part of the normal amenities of the soldier's life.

"One of his last projects was to write a history of certain of his forebears who served in the Army during the late eighteenth and early nineteenth centuries, but it was his intense interest in anything pertaining to Scotland which filled his mind outside his work, a symbol of which was the 'Gaelic Grammar' he always kept on his desk.

"David Richardson has left us, but his memory will always be green to those who had the good fortune to work with him and his character cannot fail to be an inspiration to those who follow in his footsteps."

Book Reviews

THE DESIGN AND CONSTRUCTION OF REMOVABLE ORTHODONTIC APPLIANCES.

By C. Philips Adams, B.D.S., F.D.S., D. Orth. Second Edition. Bristol : John Wright and Sons Ltd. 1957. Pp. 120. Illustrated. 21s.

A review of the original edition led to the criticism that the binding left much to be desired. This has now been remedied and the presentation thereby greatly improved.

The excellence of the photography has been maintained and two new chapters have been added. One devoted to Expansion, may receive some adverse comment from the "Anti-Expansionist" school but the author's opening remarks would suggest that he appreciates their views.

A second chapter dealing with the Elementary Theory and Technique of Spot Welding finds its rightful place in a publication of this nature.

The book should continue to be of great value to those interested in the practical aspects of the subject.

K. H.

BROMPTON HOSPITAL REPORTS. Vol. XXV. London : Lloyd-Luke (Medical Books) Ltd. 1956. Pp. 312+viii. Illustrated. 15s.

The Brompton Hospital reports comprise a series of papers by members of the staff of the Brompton Hospital, the London Chest Hospital and the Institute of Diseases of the Chest. They have already seen the light of day in the medical press, but it is convenient to have them presented annually under one cover.

This year's papers cover the usual wide variety of subjects connected with diseases of the chest and heart and the contributors include Sir Clement Price Thomas and Sir Russell Brock. The recent trend towards long-term chemotherapy in the treatment of pulmonary tuberculosis is reflected in the paper by Clifford Hoyle, Howard Nicholson and Dawson on this subject, and there are instructive papers on the management of bronchial carcinoma by Neville Oswald and by Belcher on lobectomy for bronchial carcinoma.

This excellent collection will be of interest to all medical officers, and not only to specialists, but the reader must remember that they emanate from selected centres in London. The Brompton Reports are not, and do not purport to be, representative of British thought throughout the country.

S. E. L.

SYMPTOMS AND SIGNS IN CLINICAL MEDICINE. By E. Noble Chamberlain, M.D., M.Sc., F.R.C.P. Sixth Edition. Bristol : John Wright and Sons Ltd. 1957. Pp. 508+vii. Illustrated. 35s.

It is a pleasure to welcome the sixth edition of this well-known book. There has been considerable revision of some chapters and there have been additions and deletions among the illustrations, most of which are well chosen from an illustrative point of view, but I find the coloured pictures more lurid than helpful. The book is a valuable introduction to clinical medicine, and is also recom-

mended to those service medical officers who have been divorced from clinical medicine for any length of time and who require a firm base on which to rebuild their practice.

J. A. G. C.

SYNOPSIS OF TROPICAL MEDICINE. By Sir Philip H. Manson-Bahr, C.M.G., M.D., F.R.C.P. Third Edition. London: Cassell & Co. Ltd. 1957. Pp. 287+xii. 22s. 6d.

The third edition of this synopsis is bigger than the previous edition which must be regarded as inevitable with the advances in treatment and prophylaxis which it is necessary to record. It remains a concise yet surprisingly full account of tropical medicine, and will be very valuable to medical officers in the tropics who will be able to obtain an expert reference in a reasonably sized book of light weight. There are some typographical errors, such as the dosage for aureomycin on page 243 which is given as 60 mgm. per kgm. instead of 6 mgm. but the book can be thoroughly recommended for the purpose for which it was written, that is to provide adequate information in a convenient compass.

J. A. G. C.

THE MEDICAL ANNUAL 1957, Edited by Sir Henry Tidy, K.B.E., M.D., F.R.C.P. and R. Milnes Walker, M.S., F.R.C.S. Bristol: John Wright and Sons Ltd. 1957. Pp. 570+xxxix. Illustrated. 38s. 6d.

The 75th issue of this book once again maintains the high standards with which it has come to be associated. The main portion of the book is concerned with reviews of world literature and a glance at the names of the contributors is sufficient to ensure that there has been a critical and authoritative selection.

In addition, the special articles elaborate on subjects of particular interest, and the article on blood coagulation is helpful in understanding the present concept of an increasingly complex subject. The book has become an essential for obtaining information about the most recent advances in medical practice and for quick reference to the most authoritative articles in world literature.

J. A. G. C.

REFRESHER COURSE FOR GENERAL PRACTITIONERS (THIRD COLLECTION). Specially commissioned articles from the B.M.J. London: B.M.A. 1956. Pp. 548+xvii. 25s.

This is the third volume of the well-established "Refresher Course" series. It has been studied with a view to assessing whether the publishers' write-up on the dust jacket is justified—do the articles in fact remind the practitioner of what is old and well established, do they tell him of new developments, and is the book of service to the specialist who wants to keep in touch with branches of medicine other than his own?

It is considered that this book does justice to that write-up, not only by virtue of the diversity of its subject matter, but also of the fact that the articles are so very readable. They combine the merits of the brevity of the synopsis with

the approach of the expert who is putting across his knowledge in the form of a tutorial.

The range of subjects is wide and well chosen—it is important that the doctor who qualified 20 years ago should be *au fait* with present day cortisone and anti-coagulant therapy, but it is also important that he should be in touch with modern developments in the treatment of such mundane conditions as scabies and pediculosis.

The articles which deal with medicine and the law are, it is felt, of particular value, in these times when the progress of the human body from the cradle to the grave is largely directed by a pattern of Acts, Regulations, and Orders, the incorrect interpretation of which may involve the doctor in considerable inconvenience.

To conclude, the reaction of at least one doctor is to welcome this volume to his bookshelf, while consigning to the flames his collection of the original articles, assiduously culled from the *British Medical Journal* in 1952 and 1953, and kept since then, not neatly and inaccessibly filed away, but for ready reference as authoritative, up-to-date summaries of everyday medical practice.

H. G. S.

SURGERY. A GUIDE TO SURGICAL DIAGNOSIS AND TREATMENT INCLUDING TROPICAL SURGERY (The Oxford Handbooks for Medical Auxiliaries). By W. G. Kerr, M.B., F.R.C.S.(Ed.). London: Oxford University Press. 1957. Pp. 410 + viii. 25s.

This book, which is the first of a series to be published, is an excellent introduction to surgery for medical students, stressing as it does, the general principles of surgery. For medical auxiliaries it must be one of the best there is. The book is totally devoid of illustrations but that does not detract from its value because it contains a great deal of information and is written in as simple a manner as possible.

A. V. F.

Matters of Interest

DIAMOND JUBILEE OF THE ROYAL ARMY MEDICAL CORPS

The British Medical Association are contributing to the celebration of the Diamond Jubilee of the Royal Army Medical Corps by holding a commemorative oration in the Great Hall at B.M.A. House on Wednesday, 25th June, at 5 p.m. Sir Gordon Gordon-Taylor has kindly consented to deliver the oration and all will be welcome (including ladies). The B.M.A. played an important part in the events which led to the formation of the R.A.M.C. in 1898. Sir Gordon Gordon-Taylor, who is one of our foremost medical historians, served in the Royal Navy in World War II, reaching the rank of Surgeon Rear-Admiral, but also served with distinction in World War I in the R.A.M.C.

Correspondence

From LIEUT.-COLONEL E. GREY-TURNER, M.C., T.D., R.A.M.C. (T.A.)

SIR,

The forthcoming celebration of the Golden Jubilee of the Territorial Army prompts a question. Which is the senior Territorial medical unit? I venture to suggest that the 167 (City of London) Field Ambulance can claim this distinction.

In 1883 Sir James Cantlie, F.R.C.S., who was then a Demonstrator of Anatomy at Charing Cross Hospital, and an Assistant Surgeon (with the rank of Lieutenant) in the London Scottish Rifle Volunteers, formed the first Volunteer medical unit. It was entitled the Volunteer Medical Staff Corps, and was at first composed entirely of medical students, but in 1884 a "lay" company was formed from students attending the Birkbeck Institute.

On 1st April, 1885, the Volunteer Medical Staff Corps was officially gazetted and included in the Army List. Its constitution was described as four companies, with an Adjutant, Quartermaster and a Surgeon-Commandant ("J. Cantlie, M.B.").

In due course, units of the Volunteer Medical Staff Corps were formed in other parts of the country, and the original unit in London became known as the "London Companies." Of these, three continued to consist almost entirely of medical students while two were composed of laymen. After a time the medical students comprising the medical companies transferred to the Officer Training Corps (presumably of London University). In 1906 the remaining companies became part of the R.A.M.C. (Volunteers), and in 1908 these companies provided the nucleus for one of the units of the new Territorial Force, the 3rd (City of London) Field Ambulance. The Commanding Officer, the Field Officers, the Captains and the senior Lieutenant of the new Territorial unit had all held commissions in the old London Companies of the Volunteer Medical Staff Corps.

In 1922 the 3rd (City of London) Field Ambulance, R.A.M.C. (T.A.), was merged with the 1st and 2nd (City of London) Field Ambulances to form the 167 (City of London) Field Ambulance, R.A.M.C. (T.A.). This unit therefore appears to be the present-day heir and successor of the original Volunteer Medical Staff Corps raised in London 75 years ago, and as such it seems to have a strong claim to be regarded as the senior medical unit of the Territorial Army.

I am, etc.

E. GREY-TURNER.

167 (CITY OF LONDON) FIELD AMBULANCE,
R.A.M.C. (T.A.),
57A, FARRINGTON ROAD,
LONDON, E.C.1.

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CONTENTS

	PAGE		PAGE
MESSAGE FROM H.M. QUEEN ELIZABETH THE QUEEN MOTHER	109	Army Medical Department Statistics. By S. Rosenbaum, M.A.	164
Complimentary Messages	110	The Royal Army Dental Corps during the last Ten Years. By Major-General D. J. Muil, C.B., O.B.E., Q.H.D.S., L.D.S.	166
EDITORIAL	111	The Field Training Centre. By Colonel T. M. R. Ahern, O.B.E.	168
The Years Between. By Lieut.-General Sir Alexander Drummond, K.B.E., C.B., Q.H.S., F.R.C.S., D.L.O., LL.D., D.G.A.M.S.	112	The New Training. By Lieut.-Colonel D. H. D. Burbridge, O.B.E., M.R.C.S., L.R.C.P., D.P.H., R.A.M.C.	171
Director-General's Broadcast Message to the Corps	114	The Teaching of Support Treatment of Mass Casualties to R.A.M.C. Recruits. By Captain M. J. P. Webster, Q.A.R.A.N.C.	174
Commemorative Oration on the Occasion of the Diamond Jubilee of the R.A.M.C. By Sir Gordon Gordon-Taylor, K.B.E., C.B., F.R.C.S.	116	R.A.M.C. Apprentices School. By Colonel W. A. Robinson, O.B.E., M.D.	175
A Decade of Medicine in the Army. By Major-General R. A. Bennett, Q.H.P., M.D., F.R.C.P. (Edin.)	128	The R.A.M.C. Other Rank. By Major P. Murtagh, M.B.E., R.A.M.C.	178
A Decade of Surgery in the Army. By Major-General J. Huston, Q.H.S., M.B., F.R.C.S. (Edin.)	133	Recent Advances in the Transport of Casualties. By R. I. Bodman, M.B., F.F.A.R.C.S.	179
The Army Health Organisation, 1948-1958. By Lieut.-Colonel M. M. Lewis, M.D., D.P.H., D.T.M. & H., D.I.H., R.A.M.C.	139	Hospital Planning. By Major D. S. Paton, M.B., Ch.B., R.A.M.C.	181
The Army Pathology Service, 1948-1958. By Major-General G. T. L. Archer, Q.H.S., M.B., M.R.C.P.I.	148	The Royal Society International Geophysical Year Expedition to Antarctica. By Colonel R. A. Smart, C.B.E., M.B., D.P.H., R.A.M.C.	189
Army Psychiatry, 1948-1958. By Brigadier R. Phillipson, O.B.E., D.P.M.	151	Extract of a Speech made by Dr. H. D. Chalke, O.B.E., T.D., M.R.C.P., D.P.H.	200
Ophthalmology since 1948. By Colonel J. B. George, Q.H.P., M.R.C.S., D.O.M.S.	154	EPILOGUE	200
Otolaryngology, 1948-1958. By Lieut.-Colonel H. N. Perkins, M.B.(Lond), F.R.C.S., D.L.O., R.A.M.C.	157	EDITORIAL NOTICES	201
Anaesthesia, 1948-1958. By Lieut.-Colonel K. F. Stephens, O.B.E., M.B., F.F.A.R.C.S., D.A., R.A.M.C.	159		
Radiology, 1948-1958. By Lieut.-Colonel T. M. Corcoran, M.R.C.S., L.R.C.P., D.M.R.D., R.A.M.C.	162		

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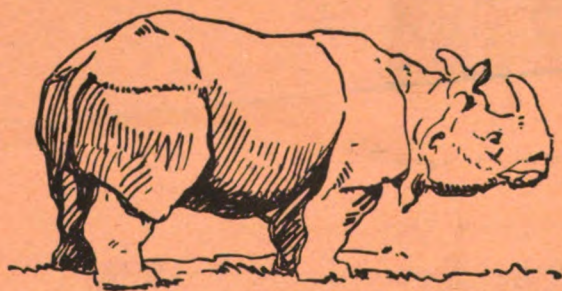
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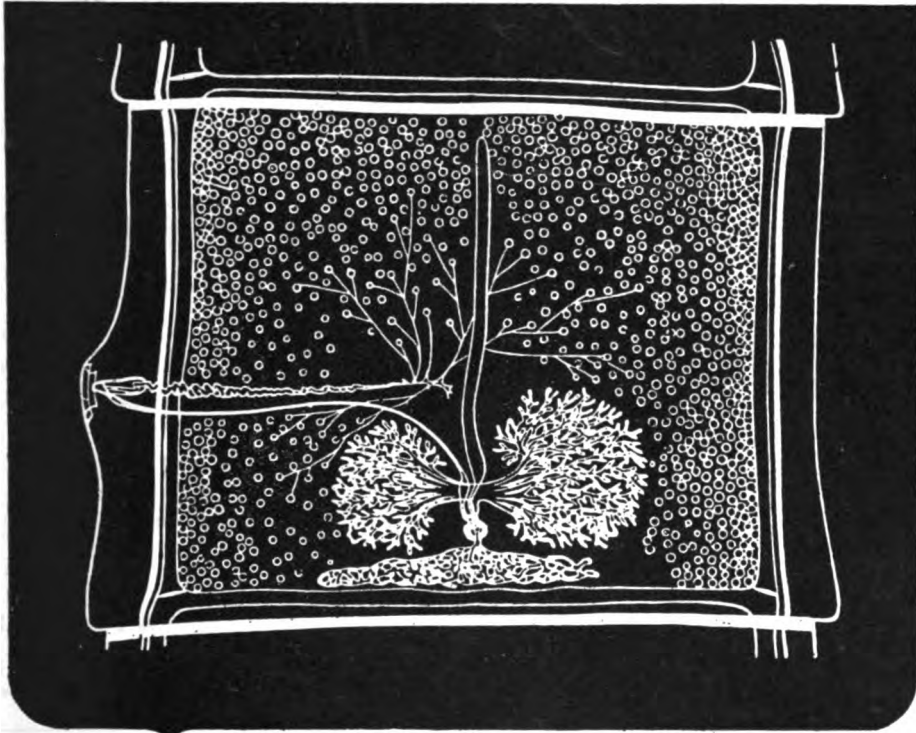
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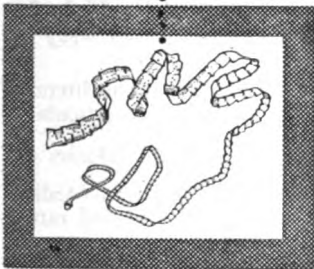
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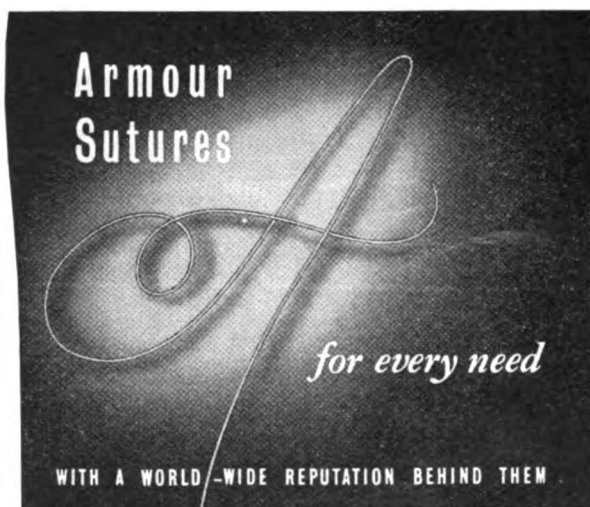
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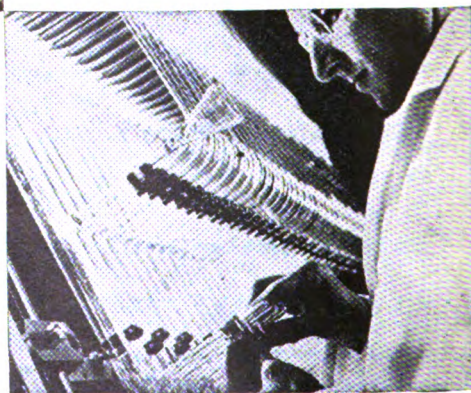
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Director-General, Army Medical Services

Frontispiece

A MESSAGE FROM HER MAJESTY
QUEEN ELIZABETH THE QUEEN MOTHER
ON THE OCCASION OF THE DIAMOND JUBILEE
OF THE
ROYAL ARMY MEDICAL CORPS

CLARENCE HOUSE, S.W.1

I am very pleased to be able to send a message of congratulations to the Royal Army Medical Corps on the occasion of its Diamond Jubilee.

Since its formation sixty years ago, the Corps has served in every theatre in which the British Army has been engaged: in the South African War and in two World Wars, as well as in many smaller campaigns.

The record of gallantry is plain for all to see. Fourteen Victoria Crosses, two with Bars, and the award of a George Cross bear ample testimony of this.

The relief of suffering and the care of the wounded have called for a standard of skill and efficiency which has been acclaimed throughout the world.

These splendid achievements of the Corps have been brought about not only through the loyalty and devotion of its Regulars, but also by the Officers and Men of the Reserve and Territorial Army, and, more recently, by the National Service men. This combination of experience and initiative has greatly added to its proud record.

We must not rest on the laurels of the past, for the future holds a great challenge, a challenge which I know will be met, and I am confident that in the years ahead the fine traditions of the Royal Army Medical Corps will be most worthily maintained.

ELIZABETH R.,

Colonel-in-Chief

June, 1958

COMPLIMENTARY

THE following messages have been received on the occasion of the Diamond Jubilee of the Corps.

From Major-General W. D. Refshauge, O.B.E., Q.H.P., Director-General of Medical Services, Australian Military Forces.

Congratulations and best wishes to all ranks Royal Army Medical Corps on the occasion of their Jubilee from D.G.M.S. and all ranks of Royal Australian Army Medical Corps.

From Brigadier S. G. U. Shier, O.B.E., C.D., Q.H.P., Director-General of Medical Services, Canadian Army.

I am delighted to extend on behalf of the Royal Canadian Army Medical Corps sincere congratulations to the Royal Army Medical Corps on its Diamond Jubilee. We value most highly the affiliation with our parent Corps and we are proud of your great traditions attained through valorous and glorious achievements. Our very best wishes for the future.

From Lieutenant-General W. A. Burki, C.B.E., H.S.P., Director-General of Medical Services, Pakistan.

I am delighted to extend sincere felicitations on behalf of myself and all ranks of the Army Medical Corps to the Royal Army Medical Corps on the auspicious occasion of their Diamond Jubilee.

These are the sentiments of old friends and reflect the high appreciation of the most helpful co-operation we have always received. We confidently hope that your future will be even brighter, and that our ties of friendship and comradeship will become stronger than ever before.

Vol. 104, No. 2, was issued on 22nd April, 1958

Authors are alone responsible for the statements
made and the opinions expressed in their papers.

Journal

of the

Royal Army Medical Corps

Editorial

IN presenting this Diamond Jubilee Number of our JOURNAL, the Editor wishes to acknowledge with gratitude the help of all who have contributed to make it a worthy memorial of the occasion. Sir Gordon Gordon-Taylor's Commemorative Oration is reproduced through the kindness of the author and that of the Editor of the *British Medical Journal*, who both felt that our pages were its rightful home. In his masterly and moving address, Sir Gordon recalls the important part played by the British Medical Association in the early history of the Royal Army Medical Corps; how they headed the deputation to the Secretary of State for War, which led to its formation. He gives many vivid examples of the close ties which have always existed between the Corps and our civilian colleagues: these links, forged in South Africa and two world wars, are stronger than ever today.

Our Directors and Advisers have reviewed the progress in their specialties during the past decade. Other articles cover recent developments in training, the transport of casualties and hospital planning, while contributions from the Royal Army Dental Corps and Queen Alexandra's Royal Army Nursing Corps form a welcome innovation. The account of the expedition to Antarctica organised by the Royal Society is ample proof that the spirit of adventure in the Corps is still vigorous, and indeed no fewer than four of our officers were serving with scientific expeditions in Antarctica and the Falkland Island Dependencies at the dawn of this Diamond Jubilee Year.

The main achievements of the Corps since 1948 have been summarised by our Director-General in *The Years Between*, and he urges us to turn our attention

to the tasks that lie ahead while profiting from the lessons of the past. Until recent times, advances in the control and treatment of wounds and disease have kept pace with developments in the means of destruction so that we could do much to alleviate the sufferings of war. None will deny that we have justified our motto through the many ordeals of this war-torn century. Now, overshadowing the great increase in destructive power of conventional weapons, a new era of potential massacre has begun with the discovery of the atomic weapon : this and its "monstrous child," the hydrogen bomb, have transformed many of our former conceptions of war. The problems confronting the medical services are stupendous and it may well be that the supreme test is still to come.

THE YEARS BETWEEN

BY

**Lieut.-General SIR ALEXANDER DRUMMOND, K.B.E., C.B.,
Q.H.S., F.R.C.S., D.L.O., LL.D.**

Director-General, Army Medical Services

ON the occasion of the Golden Jubilee of the Royal Army Medical Corps, its merits were extolled by many. It had saved lives and manpower, its courage and efficiency had strengthened the morale of the soldier, the Corps had been judged worthy of its proud motto—"IN ARDUIS FIDELIS."

Since that time, perhaps one of the most momentous periods the world has ever known has slipped by and now in 1958 the Corps is gathered together to celebrate its Diamond Jubilee.

This decade has throughout the world been characterised by a relentless cold war, insurrections and local conflicts. In order to provide medical cover for these various commitments, the R.A.M.C. has had to sponsor a continuous high-pressure training scheme for all ranks on a scale unprecedented in its history. At the same time its ingenuity has been taxed owing to the brief nomadic careers of its National Service personnel, but despite this it has wherever possible fulfilled its obligation to advance the professional knowledge and technical skill of these members during their Army service.

The passage of these years has been marked by increasing austerity and, too commonly, high hopes of progress and improved conditions have been shattered, yet the Corps has achieved much.

In the fields of chemistry, biology, physics and medicine its civilian colleagues, aided in part by the Services, have made phenomenal advances, any one of which could have given its name to this decade.

New insecticides have enabled the Corps to destroy the vectors of many infections, while modern synthetic drugs have proved of value in the prevention and cure of tropical and other diseases. Researches in the biological field have isolated antibiotics which have reduced considerably the prevalence, severity and mortality of disease. Thus the scourges of former armies—malaria, dysentery, typhus and typhoid—have been largely controlled.

The ravages of tuberculosis have been curtailed by combinations of drugs and antibiotics, and as the result of a successful trial of cases which have been symptom-free for five years, an ever-increasing number of Regular personnel are being reinstated in their former Army occupations. From this research in the military application of modern therapeutics a vast new field of medico-social work has opened up in the prevention and control of pulmonary tuberculosis among the peoples who serve in our widely deployed Army.

New missiles and the products of nuclear reactions are now to outdate conventional artillery, and with this development has come the need for greater medical cover to deal with mass casualties and radiation hazards. These new aspects of warfare have aroused the initiative and exercised the professional acumen of the Corps. As a result medical units have become flexible and mobile, and the training of all personnel has been geared to meet the gigantic requirements of modern warfare. At the same time the necessary increases in individual responsibility have been readily accepted by all ranks and their skill enhanced accordingly. By its example the Corps has in no small way contributed to the reshaping of the Civil Defence Medical Services in this country and of those in the N.A.T.O. nations.

This period has seen the displacement of the small fixed-wing aircraft by the helicopter as the optimum means of evacuating battle casualties from the forward defended localities. But even before it has become well established as such the helicopter may itself have to give way to a more manœuvrable and speedy aircraft.

In the field of physics the Corps has welcomed the advent of isotopes, the cæsium unit and the theratron to aid in stemming the advance of malignant disease affecting some of its patients. It now looks to nuclear development to provide motive power, the source of X-rays and the means of cold sterilisation of surgical instruments and dressings.

Despite the stress to which the Corps has been subjected it has never deviated from its purpose of providing the best possible care for its charges. To further this aim pædiatric units are being opened in military hospitals in all traditional Army centres. Industrial health has now taken a prominent place in the training of the medical officer, while the establishment of the Army neoplastic unit at Millbank, in liaison with the radiotherapy department at the Westminster Hospital, has been of great benefit to the Services, their dependants and retired personnel. In all its endeavours, the R.A.M.C. has had the loyal support of the Queen Alexandra's Royal Army Nursing Corps. Of special interest in this connection has been the introduction into military hospitals of the R.A.M.C. index student nurse. The continued interest of the Corps in adventure and research is shown today by the presence of its officers in Antarctica, tropical Africa and the Malayan jungle.

The modernisation of patients' accommodation and the staff working conditions in military hospitals has been severely hampered by changes in deployment. Yet nothing daunted, with the co-operation of the War Department architects and the Royal Engineers a "new look" has been introduced and real

advances made in the renovation of antiquated medical buildings. Medical equipment in the major hospitals has been kept up-to-date, while plans for refurbishing the others are well in hand. The catering and dietetic departments, under the care of the Army Catering Corps, have shown a marked and steady improvement and one can anticipate with confidence the introduction in the near future of special hospital chefs.

A less satisfactory aspect of the Corps' activity is recruiting. Early marriage and the apparent stability and security of civil life have adversely affected it. The figures for all ranks have been poor, but there is now good evidence of improvement. In the case of officers there was, as always, a post-war lull, but in addition the Corps had to cope with the antipathy shown by some of the earlier National Service entrants.

Careful selection of officers has of course played its part in restricting the number of commissions granted. Obviously, if the standard of medical practice in the R.A.M.C. at home and abroad is to equal that found in civilian life, the Army medical officer must be well above average. Today 50 per cent of the Regular officers are in possession of post-graduate qualifications, of which no fewer than 44 per cent are of the higher academic order.

As *The Times*¹ has so well expressed, "Army doctors are members of two professions, and unless they have mastered them both they fail in their duty."

The pioneer work of such men as Leishman, Bruce, Horrocks and Sinton is today followed up in the post-graduate and teaching establishments of the Corps. In them tradition and lessons gleaned in many lands are woven into the lives of medical officers drawn from all parts of the Commonwealth.

The precious emblems of valour and distinction, the Victoria Crosses and decorations of former members, are in these establishments given a place of honour and remain a continued source of inspiration to all ranks.

Throughout the history of the R.A.M.C. its civilian colleagues, who have served with it and borne the heat and burden of the day, have at all times been most willing to help. It has in no small part been due to their encouragement and guidance during the past ten years that the Corps has achieved the professional and technical standing it now enjoys.

So today the R.A.M.C. feels pride in the past and gratitude for the present, always remembering that "the present is never the mark of our designs. We use both past and present as our means and instruments, but the future only as our object and aim."

DIRECTOR-GENERAL'S BROADCAST MESSAGE TO THE CORPS ON 23rd JUNE, 1958

ON Tuesday, the 24th June, from all parts of these islands, we are to assemble in Westminster Abbey in the presence of our beloved Colonel-in-Chief, Her Majesty Queen Elizabeth The Queen Mother, to join in a service of praise and

¹ 10th August, 1951.

thanksgiving on the occasion of the Diamond Jubilee of the Royal Army Medical Corps.

The Regular, Reserve, Territorial and retired members of the Corps, together with their friends and relatives, will number between fifteen and seventeen hundred.

On their behalf I send you warmest greetings.

In 1898, the then Secretary of State for War, Lord Lansdowne, when announcing the amalgamation of the Army Medical Staff and the Medical Staff Corps to form the Royal Army Medical Corps, foretold that it would wear its title worthily.

At its Jubilee in 1948 the R.A.M.C. received great praise. In no small way it had assisted in the building of the Empire by freeing its underdeveloped areas of disease and pestilence. In so doing it had trained and encouraged the peoples of these lands to accept higher standards of medical care and advance hand in hand with us.

In the field of research many of its officers, as Semple, Lelean, Horrocks, Bruce and Leishman, had become famous.

Of the valour and courage of its members there was no doubting. The Corps had been faithful in difficulty and had well deserved its proud motto.

Today we are particularly interested in the decade through which we have just passed, a period when each one of us has had an opportunity of playing some part in advancing the Corps.

Do we merit the same esteem and praise given to our predecessors ?

In comparison with the steady and purposeful advances of science our activities during this time may have appeared to lack continuity and given the impression of living from day to day. This has been largely the result of the rapid transit through the Corps of the majority of its members, the National Service personnel.

Yet, today, I know that they look back on their Service life with feelings of pride and satisfaction. Fortunately, many were able to continue training for their chosen career and returned to civilian life the better qualified.

For the care and treatment of the sick and wounded and of Service dependants new drugs, materials, techniques and methods have been continuously sought and put into use. In this respect the achievement of the Corps has been second to none.

The development of the Army chest, head injury, neoplastic, orthopædic, pædiatric and virus centres has shown steady progress, and to maintain this the training of all ranks has been pressed forward as never before.

Meanwhile, the spirit of adventure has been growing and today our young men, as did their predecessors, enjoy pioneering in the more inaccessible parts of the world. They appreciate that high military qualities are essential and complementary to a sound professional background.

Prevention of disease and the care of the soldier remain the chief roles of the Corps. To meet the demands of modern warfare our organisation and training have been both direct and progressive and have become the envy of many nations.

Medical officers of the highest calibre are now being selected for the R.A.M.C., while the Apprentices School in the training of its pupils is laying great stress on leadership. The aim is to produce N.C.Os. of sterling character who are at the same time efficient tradesmen, the non-medical officers of the future.

Since the World War the resources of the Corps have been mobilised, sometimes under difficulty, to meet commitments in various parts of the world arising from the cold war, unrest or limited warfare. Yet, when the history of this period is written I do not think we shall be found wanting.

It is therefore with no little pride that I share your personal convictions that the Corps has achieved much.

COMMEMORATIVE ORATION ON THE OCCASION OF THE DIAMOND JUBILEE OF THE ROYAL ARMY MEDICAL CORPS

BY

SIR GORDON GORDON-TAYLOR, K.B.E., C.B., F.R.C.S.

Delivered in the Great Hall of B.M.A. House, Tavistock Square, London,
on 25th June, 1958.

I AM immensely proud of the position in which I find myself this afternoon : it is an honour and a privilege which I greatly prize to be invited to be the Orator on a memorable occasion such as this, the Diamond Jubilee of the inauguration by Royal Warrant of the Royal Army Medical Corps. Not unnaturally I am flattered that your choice should have fallen on one who is not only now a veritable Methuselah, but who might even be arraigned for divided Service loyalties, since like Proteus of old in my long life I have assumed many guises : from the well-ironed silk hat and morning coat of the first decade of the century I donned the khaki of the Corps, subsequently transferring to the blue and gold of the Senior Service in the second Armageddon, and thereafter to the drab and sombre *tenue de ville* of the modern civilian surgeon.

1898 : 1958 : sixty years on ! The chariot wheels of time roll relentlessly onward : *omnia fert aetas, animum quoque*¹ : yet would I dare to challenge the last fragment of this sad Virgilian line. Although we are assured by Sir Thomas Browne that "diuturnity is a dream and folly of expectation," that is surely but a long term reflection. Look closer ! With each revolution of Time's wheels "who runs may read" on flying felly the impress, perhaps faint, of some event or happening from the past in the life of individual, cohort, corps, nation or the very world itself. The temporal curricule may be slow-driven or swift-returning, reminding the inquirer of incidents of long ago, from "the dark Backward and Abyss of Time," or on the other hand, rapidly-recurring, so rapid as to be unnoticed, almost automatic : the unforgiving minute, the daily routine, the

¹ "Time carries everything away, even the memory."—VIRGIL, *Eclogues*, IX, 51.

reveille, "the post," the muezzin's call to prayer from minaret, the Angelus in Catholic and High Anglican Churches, the time signal of the B.B.C., the weekly Sabbath, *l'événement mensuel* in Dame Nature's physiology.

The important occasion to be remembered may recur but once a year, as for example the commemoration of the nativity or the death of Christ or the advent of a New Year: the anniversary may be a silver, golden or a diamond jubilee, as today's celebration: it may be a centenary, a quinqucentenary, as in the case of Magdalen College: a six hundred and fiftieth as in the case of Exeter College, Oxford in 1964: or even a millennium. Feasts, festivals or even more rarely fast days are prone to mark such occasions. Anniversaries of great national victories are more readily remembered by the populace as well as by the armed forces of the Crown: for example, Trafalgar (21st October), Waterloo (18th June), Alamein (23rd October), D Day or the Normandy Landing (6th June), the raid on Zeebrugge (St. George's Day, 23rd April); nor is the eleventh hour of the eleventh day of the eleventh month likely to be forgotten by those who experienced the carnage of the 1914-18 war. Despite the cynical animadversions of that great surgeon and profound philosopher, the late Wilfred Trotter, who in his Hunterian Oration for 1932 seemed to deprecate commemorative orations and occasions, the Royal College of Surgeons of England continues to honour with appropriate ceremonial the anniversary of John Hunter's birth (14th February), and the Hunterian Society dutifully utilises the previous day (13th February) for the same purpose. The Listerian festival is observed on 5th April, the date of his birth. The Royal College of Physicians with consummate piety commemorates William Harvey on St. Luke's Day rather than on the day of his birth. The youngest Royal College appears not to honour any patron saint, unless for aught I know it be the Roman goddess, Juno Lucina, whose famous festival, the Matronalia, was celebrated by matrons and virgins on 1st March.

It is fitting that from time to time we should look back and take stock of ourselves: for "people will not look forward to posterity, who never look backward to their ancestors." It may be well today not to dwell too much on the birth-pangs attending the inauguration of the Corps. The words of the Master Himself are not inapposite: "A woman when she is in travail hath sorrow . . . ; but as soon as she is delivered of the child, she remembereth no more the anguish for joy that a man is born into the world." To re-tell the story of the struggle with the War Office and governmental circles of that period for the creation of this Corps would label me with the unsavoury sobriquet of "the man with the muck-rake"; there is no need to exhume an unhappy story: I am no coprophile. Nevertheless, there is one aspect of the midwifery affecting the birth of the Corps on which I must lay emphasis—the important part played by the British Medical Association which finally (20th January, 1898) sent a powerful deputation of representatives to wait on the Marquess of Lansdowne,²

² Lord Lansdowne was confined to his home, Lansdowne House, at the time, so the deputation went to see him there instead of at the War Office. It so happens that the Army Medical Department now occupies part of the new Lansdowne House, a block of flats built on the site of the old mansion, which was demolished in 1934.—Ed.

then Minister of State for War. The deputation was introduced to Lord Lansdowne by Dr. Farquharson, himself a former Army medical officer and at that time Member of Parliament for West Aberdeenshire ; it included the President Elect of the British Medical Association, Sir Thomas Grainger Stewart, who also represented his own University of Edinburgh and who a couple of months later received an Honorary LL.D. from Aberdeen on the same occasion as my own graduation with an Arts degree in Classics. Other members of the group were Professor (later Sir Alexander) Ogston, whom I knew and who was well known to my mother's family, and whose portrait adorns my wall, Surgeon-General Sir James Mouat, V.C., K.C.B., a retired Army medical officer, who won his V.C. at Balaclava, as well as the most important officers of the B.M.A. They stressed the anxiety felt by the whole medical profession over the state of the Army Medical Department at that time, and explained to the Minister for War that it was their sense of duty towards the Army and the nation that had made them come forward with proposals for rectifying the unsatisfactory state of affairs. In just two months' time the *British Medical Journal* was able to announce "some very satisfactory announcements" from a parliamentary debate which took place in March. Then followed the speech at a mayoral banquet in the City of London on 4th May by Lord Lansdowne when he stated that there would be a new Army Medical Corps and that Her Majesty, Queen Victoria, had been pleased to signify her intention of bestowing upon it the title "Royal." The olive branch so gracefully offered by Lord Lansdowne was eagerly and loyally accepted by the profession, and Lord Lister said that the address of the Minister for War had removed a terrible cloud from the medical profession and a terrible evil from the nation.

Some in this room may have read or even listened to the late Sir James Barrie's Rectorial Address on Courage to the "red gowns" of St. Andrews University just over thirty-six years ago, and some may remember that towards the close of his address he posed the question how some old graduate returning to his *alma mater* would spend his time if this were restricted to a single hour, and whom and what he would seek in that brief space of time ; or better still, with whom would he choose to have a few minutes' conversation from among the many who had taught or had studied within that ancient seat of learning during the five hundred years of its existence. This afternoon I propose to try to conjure up before you a few of those who have played some distinguished role in the Corps and added to its fame and prestige ; but I am going to go further back than 1898, reminding you of some of the great names in British military medicine from early times as well as endeavouring to recall before the eyes of those who knew them some of the great Shades who belonged to the Corps since its inception, and on behalf of those of less mature years to invest certain legendary names with some panoply of their vital attributes. Your particular flair or genius for integrating every officer and every man of whatever rank or origin cannot be passed over without unqualified praise, and this genius has manifested itself in *crescendo* during successive wars. Civilian consultants and others will inevitably come within my purview this afternoon as well as

Regular officers of the Corps. Many of your Army medical ancestors are far beyond our ken this afternoon : John de Arderne, who accompanied Edward III at Crécy in 1346, Thomas Morstede with Henry V at Agincourt in 1415, Gale and Clowes, Woodall and Wiseman. Despite the melting which I have for Sir Stuart Threipland, who was Prince Charles's chief medical adviser in "The Forty-Five," it would be with his *vis-à-vis* in Cumberland's Army, Sir John Pringle, that I would want a few words. Pringle, who first studied in St. Andrews, then Edinburgh and Leyden under the great Boerhaave, Pringle who may be regarded as the founder of modern military medicine and who by his influence with his commanding officer in the Lowlands, the Earl of Stair, was able to ensure respect and protection from enemy attack for military hospitals.

I should find it difficult to break off conversation with those great surgeons of the Peninsula and Waterloo : Sir James McGrigor, Guthrie or Hennen, the last of whom died at a relatively early age at Gibraltar of an epidemic fever which he was assiduously endeavouring to control ; who had served under Abercromby in Egypt, in the Peninsula was senior surgeon of the Fifth Division, and was in charge of the surgery for the General Staff after Waterloo. If statuary, obelisks or eponymous buildings be a talisman to ensure immortality, McGrigor stands secure for all time. A hundred years have passed since his death. Sired by an Aberdeen father, he was born at his mother's paternal home at Lethendrey, Inverness-shire, in 1771. Much of his education took place in Aberdeen—the Grammar School there, an Arts degree, the Aberdeen Royal Infirmary—but he also studied medicine in Edinburgh, walking the hundred-odd miles to the Scottish capital and visiting St. Andrews on the way. He purchased a commission in the 88th Connaught Rangers and saw service with them for about ten years, at Nijmegen, Arnheim and at Granada in the West Indies. While Deputy Inspector of Hospitals in the Southern Command he had to make arrangements for the battered remnants of Sir John Moore's forces from Corunna : finally in January, 1812, at the request of Wellington, he arrived in Lisbon to undertake the medical care of the troops. He was present at the battles of Badajos, Burgos, Valladolid, Salamanca, Vittoria and Toulouse. Speaking of the technical skill of his officers, McGrigor wrote : "Great experience and reflection had at this time created a body of operators, never excelled or before equalled in the British Army." But it was McGrigor's organising ability that advanced military medicine : in defiance of Wellington's orders he availed himself of commissary transport to evacuate the wounded, arranged for the wooden frameworks of huts to be sent out from England to accommodate 4,000 sick ; instituted medical boards to decide who should be sent back for convalescence. In 1815 McGrigor became Director-General and remained D.G. till 1851. Aberdeen also owes much to him : he inaugurated the Aberdeen Medico-Chirurgical Society and in its archives are collected many of his personal papers, and these have been annotated by Captain N. F. Harding in extracts from the *Miscellanies of Sir James McGrigor*.

George James Guthrie has always been a hero of mine : he was posted to the 29th Regiment when only 16 years of age, serving with it in North America

and the Peninsula ; in the latter he served till 1814. He hastened to Brussels after Waterloo and among other operations successfully amputated at the hip-joint. This was only the second occasion on which success had attended a British surgeon performing this operation, the other successful case being that of another Army surgeon, Mr. Brownrigg, who in 1812 successfully amputated at the hip-joint the limb of a man who, a year before, had sustained a gunshot wound of the upper third of the femur. Brownrigg had been the first English surgeon to perform this operation in the field at Elvas in 1811, though unsuccessfully. Guthrie had previously had an unsuccessful case at Ciudad Rodrigo (1812) : his successful case was a French soldier. Larrey performed the operation seven times : two operated upon during the Russian campaign of 1812 survived operation, one unfortunately dying of dysentery thirty days after ; the other was seen completely cured at Witterp three months after on his way back to France. What especially commends this fine old surgeon to all is that for thirty years he lectured and gave demonstrations to the officers of the Army, Navy and the East India Company without money and without price as a mark of the esteem in which he held them. His experience of military surgery was enormous, and he cared not a fig for the views of John Hunter and John Bell, who had hardly seen an enemy, on the appropriate time to amputate in those requiring it, and he insisted on ligaturing both ends of a divided artery at the site of injury. He was President of the College in 1833, 1841, and 1854 ; he devised a method of exposure of the peroneal artery which was called "Guthrie's bloody operation" ; he was called "the English Larrey," refused a knighthood, spoke French like a native, and lived at 4 Berkeley Street, Berkeley Square.

A wave of the hand must suffice to greet Sir Charles Bell, for I have had a lot to do with him of late, and the minutes are speeding fast. I can admire his draughtsmanship and his anatomical and pathological illustrations at leisure at Middlesex Hospital, at the Royal Army Medical College or at the Royal College of Surgeons in Edinburgh. There is only time for a salute for General Sir Thomas Longmore, who had been professor of surgery at Chatham and Netley. High up on the façade of the London School of Hygiene and Tropical Medicine you may see carved in stone the names of men who have made signal contributions to the prevention, knowledge and treatment of disease. Among these illustrious names you may read those of Edmund Alexander Parkes (1819-1876), an Army surgeon, the founder of the science of hygiene ; David Bruce and William Leishman, both members of the Corps, and Ronald Ross from an allied service. William Leishman, who succeeded Almroth Wright in the Professorship of Pathology at Netley from 1903 to 1910, continued the work started with Wright on anti-typhoid inoculation and also discovered the parasites of Kala-azar and Delhi boil, finally becoming Director-General. Sir David Bruce discovered the *Micrococcus melitensis* of Malta fever, which now bears his name : he found the trypanosome of tsetse-fly disease and proved that the trypanosome was conveyed by the bites of the flies *Glossina palpalis* and *Glossina morsitans*. Lieut.-Colonel Sir David Semple joined the Army Medical Service in 1883, but in 1905 resigned to accept service under the Government

of India to organise and inaugurate a Central Research Institute, where he succeeded in preparing a carbolised vaccine against rabies and achieved much in improving the antivenene employed against snake bite. Others who have worked in the Corps, such as Almoth Wright, world-famous for his studies in immunisation and his success in the practical elimination of typhoid fever as a scourge to armies in the field, and Alexander Fleming, famous for his work on penicillin, have their names enshrined in the laboratories of St. Mary's Hospital, while Fleming's ashes rest in St. Paul's Cathedral. The name of Horrocks is known the world over in connection with a safe water-supply, and some here will have known Tulloch and Adrian Stokes, who died at an early age of the maladies which they were respectively studying.

Brigadier Sir Lionel Whitby was one of whom any corps, profession or nation might well be proud. Doubtless I knew him longer than anyone in this room this afternoon, for forty years have passed since we first met at a clearing station at Tincourt on the Somme as surgeon and patient respectively, when he had been grievously wounded by shell-fire on the road from St. Emilie to Lempire-Ronssoy a few hundred yards from the battle-front and a few days before Von Marwitz hurled the whole might of the German Second Army against the few divisions of Gough's thinned and extended line. None could fail to admire the courage and patience which Whitby displayed in bearing uncomplainingly the disability which he suffered. Few probably knew the high level of his dismemberment ; those who were aware marvelled the more at his triumph over the handicap. If services to humanity are the standard of a man's greatness, Whitby stands high among the great benefactors of mankind. I need only ask you to turn your gaze backward to that great Army Blood Transfusion Organisation of the 1939-45 war years, which he inaugurated, developed, administered and commanded, an organisation for which more than three-quarters of a million donations of blood were collected, which not only supplied our own armies, but also some of the armies of our allies, which created and trained almost a corps of expert transfusion and resuscitation officers, which was the model and at the same time the envy and despair of every army medical service. When it is remembered that 10 per cent of wounded men require transfusion fluids, the magnitude of Whitby's service to humanity may be gauged. As was said on another occasion of Lister, it might equally be said of Whitby : "Not a nation, but the whole world salutes you" ; yet the man who brought salvation to a hundred thousand wounded men and women remained intensely modest. This is not the occasion to refer to his work on the sulphonamides, his reign at Downing College, his Vice-Chancellorship of Cambridge University, but he was the foremost clinical pathologist of this tide of time.

There were two Directors of Medical Services of armies whom I would like to meet again : Menus O'Keefe of Rawlinson's Fourth Army, and Bruce Skinner, D.M.S. of the Fifth Army, geologist in India and South Africa, a pathological investigator, a doctor possessed of no ordinary clinical acumen, whose light was dimmed by the misfortunes befalling the headquarters staff of the heroic Fifth (Gough's) Army. Keogh, a great Director-General, I never

knew : he was recalled from retirement to handle the reins in the 1914-18 war : surgeons like Arbuthnot Lane, Pearce Gould and Bland-Sutton had the very highest opinion of him. Babbie won the Victoria Cross at Colenso in 1899 and was later knighted for his services ; I used to meet him in the train not infrequently between Aldershot and London. R. J. Blackham was a vital person, D.D.M.S. of the 9th Corps of the Fourth Army in 1918, a barrister-at-law of the Middle Temple, indefatigable as a worker till the end of his long life. I am making an exception when I mention an officer of the Corps still alive who by his work at 8 Stationary Hospital, Wimereux, brought fame upon himself and on the Corps to which he belonged by the success of his treatment of gunshot-fractures of the long bones. His work earned the commendation of men like Robert Jones and Arbuthnot Lane. That man is Meurice Sinclair, C.M.G., who probably did more to mitigate the pain of the wounded soldier than any other individual.

I would like a smile from Sir Thomas Gallwey, who was so courteous when D.M.S. of the Aldershot Command in the early part of the First War : a great gentleman, a great judge of horseflesh, a great rider. Anthony Bowlby served with you in the South African and the Great War : there remains for me the memory of this indefatigable chief consultant to the Forward Area in the 1914-18 war : Bowlby—"The Baron" he had been called in pre-war days, now it was "The Baron of Bapaume" always ready to encourage, when surgeons' spirits were low from battle-news and the state of the casualties. He became a president of the College, but it will be as a great military surgeon that he will long be remembered and his portrait at the College is happily in his uniform.

Sir George Makins directed the surgeons and the surgery at the French Base, as Bowlby guided in the casualty zone : he had the sagacity of a judge, the courage of a lion in his treatment of aneurysm and other injuries of arteries—a penchant shared by Maybury, Rob and others : he was one of the most charming of men. Many here will remember Cuthbert Wallace with affection : it would be difficult to forget the upright military figure, the blue and white bow-tie, his intense desire to help, and from the aspect of military surgery, what he did to promote the surgery of the abdominal wounds of war. Despite the views of Sir William MacCormac relating to the treatment of those wounded in the South African War, Makins remained firmly of the opinion that "perforating wounds of the small intestine are usually fatal ; every patient in whom the condition was certainly diagnosed died, if unoperated." The facts of the 1914-18 war soon convinced Wallace also of the necessity of surgical help for these cases, and elsewhere I have written that "Saint Cuthbert must from henceforth be adopted as the patron saint not only of those stricken in the belly by the missile of our adversary, but also of such surgeons as have a special interest in the abdominal wounds of warfare." The Mesopotamian Army in the First War enjoyed the benefit of George Grey Turner's help when he was consulting surgeon at Amara ; he was a great personal friend, one of the greatest surgeons of the century, an early worker in thoracic surgery, and even in 1918, when on a surgical mission from the Army to the U.S.A. was urging pulmonary decortication in some cases of old hæmothorax. The two surgeons, however, who con-

tributed most to promoting the surgery of thoracic wounds in the 1914-18 war were Pierre Duval of France and George Gask of St. Bartholomew's. Gask was a most likeable personality : consulting surgeon first at the Rouen Base and afterwards to the Fourth Army, a post in which I succeeded him, I am sure on his insistence, in the last few months of the war.

More brilliant by far but only just imping his wings for his upward flight in chest surgery was Tudor Edwards, an old house-surgeon of my own, the colleague at No. 6 C.C.S. at Barlin of another distinguished surgeon, Owen Richards, who did so much for the abdominal wounded in the First World War. Contrary to directives from authority, fortified by his own appreciation of the damage produced by enemy missiles of the 1914-18 war, Richards performed his first laparotomy for a belly wound on 28th January, 1915, and a famous case of his operated on on 18th March, 1915, was a milestone in the advance to intelligent treatment of wounds of the belly. France lagged behind Britain in her surgical approach to abdominal wounds and it was only on the eve of the Somme offensive in 1916 that the Academy of Surgery of Paris decided by formal vote in favour of early surgery. Of that charming fellow, Hamilton Drummond, I can only say in Rutherford Morison's words, "He played the game." I would love a word again with that fine Highlander, Jack Anderson, one of the very best surgeons on the British front, who died at an early age in the Chair of Surgery in St. Andrews, and with his namesake William, whom many will remember as consulting surgeon to the Scottish Command in the 1939-45 war. Charles Gordon-Watson, consulting surgeon to the Second Army in the First War and to the Home Forces in the Second War, was the highest type of St. Bartholomew's surgeon, a great gentleman, an excellent "mixer" and soldier, for he had had three wars. John Fraser of Tain I knew slightly in Edinburgh before 1914 ; next I saw him at work in 33 C.C.S. at Bethune in the First Army area during the First War, and subsequently on frequent occasions in the Scottish capital where he attracted surgical pilgrims from all over the world as Professor of Clinical Surgery, finally attaining the distinction of the Vice-Chancellorship. He was one who added laurels to the prestige of the Corps. Perhaps I can best recall him to those here who also knew him in those inimitable words of his colleague, Sir James Learmonth, who spoke of him thus : "When he came to my wards in consultation he would arrive with that attractive slightly rolling gait, radiating hope and confidence : listen attentively to the history : make the deft and gentle examination that only he could : and then stand back a little in the attitude so many will remember—head a little to the right, the right eye half closed, the quizzical smile. Then came the opinion—obscurities clarified, a diagnosis, a line of treatment strained to the limit to secure any hope of favourable outcome. A word or two of encouragement to the patient and he was gone." What a word picture !

No reference to the Corps would be complete without naming Philip Mitchiner, one of the most colourful personalities in the surgical profession in the last forty years. A keen Territorial, he was devoted to the Corps ; a man who sought no favours from anyone and called a spade a spade : he was almost

bowed down with decorations which he was apt to conceal under a raincoat, and someone described the cut of his hair and appearance as that of a mediæval monk. The stories told of him, many apocryphal, are legion : few surgeons have been more beloved than Philip "Mitch." A Mitchiner Medal perpetuates his memory and his devoted attachment to the Corps. He was the only Territorial medical officer who had held every rank from private to major-general.

The capacity for sustained work in operating theatres sometimes seemed to bear a relationship to the physical height of the surgeon : two names that remain indelibly fixed in my mind are those of James L. Thomas, brother of the late Sir William Beach Thomas, the writer, surgeon to a Midland Territorial Clearing Station, happily still alive, and J. J. M. Shaw, whose powers of endurance were equalled only by the excellence of his surgical judgment and who had a brief period of service in the Middle East in the 1939-45 war as consulting surgeon before succumbing from dysentery. Any reference to the Casualty Clearing Stations at Brandhoek in that autumn of 1917 would be incomplete without mention of Colonel W. G. Sutcliffe, under whom I served not only in a surgical team in Flanders in 1917, but also in the Fifth Army Retreat of March 1918, when he succeeded in evacuating all his wounded in empty ammunition trains which he commandeered, and all this at a time when the Hun hordes were to be seen only a mile or two distant. Of each of these men it can be truly said : *In arduis fidelis*.

The ink is scarcely dry on the lines that have recently been penned in tribute to Alfred Webb-Johnson. The hospital which he served and administered at Wimereux—14 General—became known throughout the whole Commonwealth and Empire. From the Boulogne Base to which he was one of the consultants in the last year of the war came his Hunterian Lecture, *The Surgical Aspects of Typhoid and Paratyphoid Fevers*. For many years he had been chairman of the Army Medical Advisory Board, Honorary Surgeon to The Queen Alexandra Military Hospital, Millbank, and to the Royal Hospital, Chelsea.

The cavalcade has passed from view. The captains and the kings depart : and from the past we are returned to the fierce daylight of the present, our eager eyes directed ahead along the vista of the future with all its incertitude. From Pericles to Ecclesiasticus, by Burke and Emerson we are exhorted to look back to those who have begotten us or preceded us in the race. *Undoubtedly* there is a place for anniversary occasions : remembrance is the greatest incentive and inspiration that history can offer to those who labour in similar causes today. High up on the Castle Rock that surmounts and guards the Scottish capital stands the beautiful memorial to Scotsmen and Scotswomen who made the supreme sacrifice in two great conflicts. In one of the shrines commemorating the fallen, not of the R.A.M.C. but of the Royal Scots Fusiliers—a regiment which seems now to have lost its proud identity, but with which I own some family connection—you may read those famous lines which Thucydides the historian and great master of Greek prose puts on the lips of Pericles in his famous oration over the Athenian dead :

ἀνδρῶν γὰρ ἐπιφανῶν πᾶσα γῆ τάφος,
καὶ οὐ στηλῶν μόνον ἐν τῇ οἰκείᾳ
σημαίνει ἐπιγραφὴ, ἀλλὰ καὶ ἐν τῇ μὴ
προσηκούσῃ ἀγραφὸς μνήμη παρ'
ἐκάστῳ τῆς γνώμης μᾶλλον ἢ τοῦ
ἔργου ἐνδiciατᾶται.

"The whole earth is the tomb of heroic men, neither is their story graven only on stone which covers their clay, but abideth everywhere wrought in the stuff of other men's lives." Wrought into the stuff of other men's lives ! Into our lives ! Perhaps it is unnecessary to go so far back as to Pericles and the Athenian dead. There are memorials nearer at hand, and there may be some who derive their inspiration from visible symbols in the Historical Museum of the Corps, which owes its existence to the vision and enthusiasm of Lieut.-General Sir Neil Cantlie and over which Major-General Eric Barnsley exercises his benevolent sway : there may be seen even flags taken at Port Said or those that have flown over Eoka assassin encampments, apart from much else to stimulate loyalty. Or perhaps a better spiritual background and more inspiration are to be found by a visit to some of those cemeteries so beautifully tended by the Imperial War Graves Commission—some little bit of England on a foreign shore. Only four or five days ago I wandered round some of the many military cemeteries in the Ypres salient, Vlamertinghe, Brandhoek, Brandhoek where lies buried one of your two heroes who won the Victoria Cross-with-Bar, Noel Chavasse. By a curious coincidence the cemetery where he now lies is situated on the exact spot where was placed the main dressing station of the field ambulance commanded at the time of Chavasse's death by Arthur Martin-Leake, the other R.A.M.C. officer to have a Bar added to his Victoria Cross. That corner where the road to Reninghelst crosses the Poperinghe-Ypres railway is a historic spot for the Corps. Wandering round on a typical Flanders day as I remember it in 1917, and looking at the graves of R.A.M.C. officers and men as well as of others, some lines of Simonides, written for the Athenian war monument at Plataea where Greece defied the Persians, kept drumming in my ears :

Εἰ τὸ καλῶς θνήσκειν ἀρετῆς μέρος ἵστί μέγιστον,
ἡμῖν ἐκ πάντων τοῦτ' ἀπένειμε τύχη.
Ἑλλάδι γὰρ σπεύδοντες ἐλευθερίην περιθεῖναι
κέμεθ' ἀγηράντῳ χρώμενοι εὐλογίῃ.*

In arduis fidelis. If I required occasions to exemplify and justify your proud motto, two or three come to mind at once : the devoted service of the R.A.M.C. officers in the typhus camps at Wittenberg and Gardelegen, where prisoners of war buried their own dead in the camp under jeers from German onlookers

* If Valour's best be gallantly to die,
Fortune to us of all men grants it now.
We to set Freedom's crown on Europe's brow
Laboured, and here in ageless honour lie.

outside the camp-wire. Many prisoners offered their services as nurses and many lost their lives. Priestley, Lauder, Vidal, Scott Williams, Brown and Davy were deservedly honoured. Another occasion was described by the well-known Melbourne surgeon, E. E. Dunlop, but his description of the most appalling conditions among the prisoners of war in Java and on the Burma-Siam Railway, the utter inhumanity of the captors, the silent insolence of Japanese medical officers (one is fortunately named), the flogging of the sick, together with the photographs illustrating the dreadful state of the unfortunate men is one that should not be read by those desirous of establishing close Japanese friendships. In the wonderful efforts made to succour these poor dregs of humanity, the amazing improvisation to render surgical assistance, blood-transfusions, etc., Dunlop mentions a number of R.A.M.C. officers: Lieut.-Colonel J. St. C. Barrett, Major T. Max Pemberton, Major Marsden, Major Smythe, Captains Markovich and McConachie. The drawing of lots among the R.A.M.C. officers of 12 Casualty Clearing Station, the last functioning C.C.S. at Dunkirk, as to who should remain with the wounded, has been dramatised. *In arduis fidelis*. How well is your tradition set to words in those lines which appear on the cover of Peter Lovegrove's *History of the Royal Army Medical Corps*, lines written by a distinguished officer of your Corps:

Unarmed they bore an equal burden,
Shared each adventure undismayed;
Not less they earned the Victor's guerdon,
Not least were these in the Crusade.⁴

But fine as these lines are, they are surely an understatement, for you are a group of men apart, masters of two professions, and unless you have mastered them both you will fail in your duty. You must be soldiers knowing something of the structure of armies and of their ways in peace and war. Lacking that knowledge, you cannot give your full service in preserving the health of troops at all times and in saving life under fire.

I have not the vision or the gift of prophecy of old Tiresias, but I know full well that the great tradition of the Corps is in safe keeping in your hands and with those who shall come after you. *In arduis fidelis*, for faithfulness is allied to courage, "the loveliest virtue, the rib of Himself which God sent down to His children," and you will in your work vie with Wordsworth's happy Warrior:

Who, not content that former worth stand fast,
Look forward, persevering to the last,
From well to better, daily self-surpass:

These thoughts are for your contemplation, as I offer to the Corps laurel for tribute on this its Diamond Jubilee, and rosemary for remembrance of those who have preceded us on the way. May I by way of epilogue add these four words in the old Latin tongue:

Surgat gloria usque astra.

⁴ From a *Hymn for the Fallen of the Royal Army Medical Corps*, by Brigadier R. B. Price, D.S.O.

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After the Oration, a vote of thanks to Sir Gordon was proposed by Dr. S. Wand, the Chairman of the Council of the British Medical Association. The Director-General, Army Medical Services, Sir Alexander Drummond, then read a message of congratulations to the Corps which he had received from Queen Elizabeth The Queen Mother, and which now appears in the forefront of this number. He said that we were deeply moved by the close and kindly interest that Her Majesty had at all times taken in the Corps, and as our Colonel-in-Chief she was a constant inspiration to us all.

Sir Alexander went on to speak of the debt owed to the British Medical Association in the formation of the Corps which was brought about by the amalgamation of the Army Medical Staff and the Medical Staff Corps, largely through the energy and influence of the Association.

"I would remind you, Mr. President," said Sir Alexander, "that when the then Secretary of State for War made this announcement, a distinguished predecessor of yours, Lord Lister, said 'I can but express my unbounded satisfaction to the Marquess of Lansdowne for the statement which he has made in regard to the Army Medical Staff. He has cleared the way and in the future the Army will be served by the best elements of our profession.'

"Since then we have always had your help and encouragement in furthering our professional standards, for which I can assure you we are most grateful.

"To mark the occasion of the Diamond Jubilee of the Corps you have honoured us by asking the most eminent surgeon of our time, Sir Gordon Gordon-Taylor, to give an oration which will not only be passed on to posterity but will be cherished by all ranks.

"We are glad you thought us worthy of this honour as we have tried hard to live up to the best ideals of the profession, and in thanking you and Sir Gordon for the high tributes you have paid us we have the great satisfaction of knowing that we have not been unsuccessful in our efforts. "

A DECADE OF MEDICINE IN THE ARMY

(INCLUDING PÆDIATRICS, DERMATOLOGY, VENEREOLOGY AND PHYSICAL MEDICINE) 1948—1958

BY

Major-General R. A. BENNETT, Q.H.P., M.D., F.R.C.P.(Edin.)

Director of Medicine

THE discovery of streptomycin and the broad spectrum antibiotics has made the past decade a notable one in the fight against disease, and the success gained against such diseases as tuberculosis, typhoid and typhus has had a special impact on military medicine. There has been a constant search for and trial of new drugs, in which the Royal Army Medical Corps has played a worthy part.

One of the highlights of the past ten years has been the changed outlook in pulmonary tuberculosis and tuberculous meningitis, and this has been of special significance to the Army. In the past, the diagnosis of tuberculosis spelt doom as far as a man's career in the Army was concerned, but with the advent of streptomycin, para-aminosalicylic acid (P.A.S.) and isonicotinic acid hydrazide (I.N.A.H.), and of resection of the lesions in selected cases, the continuation of the patient's Army career is almost assured.

The Army Chest Centre was opened in 1946 and since then has treated patients from all over the world. Major thoracic surgery started in 1953, and the volume of work has increased steadily since then. So far, ninety officers and other ranks who have had chemotherapy with resection of tuberculous lesions have returned to duty; sixteen have been on duty for three years, nineteen for two years and the remainder for one year or less. In no case has reactivation of the disease occurred. Members of the Gurkha Brigade suffering from pulmonary tuberculosis are treated in the Gurkha sanatorium which was opened in 1951 as a wing of the British Military Hospital, Kinrara. This has revolutionised the treatment of tuberculosis in Gurkhas, enabling many to return to duty, and the remainder to go back to their homes in Nepal cured and fit to work again. Selected Gurkha patients considered suitable for surgery are now sent as a routine to the Army Chest Centre, Hindhead, where fifty-four have been treated surgically. Thirty-one of these have already returned to Malaya, where most have been classified as fit to resume duty with the Brigade.

Tuberculous meningitis, once universally fatal, is now curable, and great success has been achieved with the treatment given in the Military Hospital, Wheatley. This includes both intrathecal and systemic streptomycin and I.N.A.H. with intrathecal injections of tuberculin. On this regime nearly a 90 per cent recovery rate is expected, and so far two men have returned to duty in the Army, while a number of others are back in civilian life at full work. In the same hospital, patients suffering from disseminated sclerosis are receiving intrathecal injections of tuberculin as a possible therapeutic measure. This research is still in its early stages, but the results are promising.

In 1947, chloramphenicol, one of the earliest broad spectrum antibiotics, was prepared by a fermentation process from *Streptomyces venezuela*. It was

synthesised in the following year, and was first tested in Mexico City in 1948 on epidemic and murine typhus. The results were highly encouraging, and a supply of the drug was taken to Malaya by Smadel and his team to try its effect on scrub typhus. It was found to be a rapid cure for this dread disease, and it is a pleasure to place on record that officers of the Royal Army Medical Corps played an important part in this discovery. The first patient treated with the drug in Malaya was a soldier. Officers of the Royal Army Medical Corps in Kuala Lumpur were the first to employ single doses of 3.0 grammes of chlor-ampfenicol in the treatment of scrub typhus, with good results. Later aureomycin was found to be equally effective.

Two members of the first group of patients treated as cases of scrub typhus were subsequently proved to have typhoid fever. It was the favourable response of these patients which led to the more detailed studies of the use of chlor-ampfenicol in the treatment of fevers of the enteric group, for which it was found to be a cure. Then and later our officers did much to advance knowledge in the treatment of this group of diseases.

During the past decade an intensive search for better antimalarial drugs has proceeded and a large number of new compounds have been studied. Our hospitals have played their part in this search for the ideal treatment of malaria. Among the 4-aminoquinolines, chloroquine was found to surpass all the others, and primaquin, one of the 8-aminoquinolines, was found to be superior to and less toxic than pamaquin. Chloroquine produces clinical cure of all types of malaria and radical cure of malignant tertian disease in addition to being an excellent suppressive agent against all species of the malarial parasite. Primaquin is active against the primary and secondary exo-erythrocytic forms, and therefore will produce a radical cure in benign tertian malaria.

We have undertaken continuous trials of new amœbicidal drugs, but emetine still stands supreme in the treatment of amœbiasis. Chloroquine was found to be successful in hepatic amœbiasis, and a drug called glaucarubin, among others, produces clinical cure of amœbic dysentery but fails to prevent relapses. Our hospitals in the Far East took part in the investigation of this drug.

Rheumatic fever, one of the most disabling diseases occurring among young soldiers, has been the subject of a Medical Research Council trial in which the results of treatment with cortisone and with aspirin were compared. In our hospitals, apart from an investigation into epidemiological factors, a therapeutic trial has been carried out to compare the results of combined cortisone and aspirin therapy with those of aspirin alone on the course of the illness. Results so far have shown that the combined therapy is very little superior to aspirin alone.

In the search for an efficient oral preparation of penicillin, a trial of penicillin V was conducted in various military hospitals. This is a phenoxymethyl-penicillin which is acid-stable and is therefore not affected by gastric acidity. It was found to be a most useful drug in streptococcal infections of the throat, and in the treatment of young children, who dislike injections. Another trial is now in progress using a combination of penicillin V and a sulphonamide.

Sprue still continues to baffle us, but recent work has shed new light on the problem. Our own team in Hong Kong has played its part by investigating a large number of cases which occurred there some years ago. One result which has so far emerged is that a dietary component such as rancid fat cannot be excluded as a major causative factor. Folic acid deficiency may arise at an early stage and plays an important part in the development of the syndrome. There is also a chronic form of sprue in which synthesis of fat may occur in the intestinal lumen. It was found that this form responded to anti-bacterial therapy, especially if combined with a high protein diet.

Leptospirosis became one of the chief hazards of the Malayan Campaign in recent years, and our officers have grasped the opportunity of studying this disease. They have made important contributions to the knowledge of its early diagnosis, and have evaluated the different forms of treatment. They have also played a large part in the research into the different forms of encephalitis found in the Far East, and an investigation was initiated in 1952 with the aim of differentiating the short term fevers of unknown origin which are the highest individual cause of admission to medical wards of the military hospitals in the Far East. This investigation has so far shown that 30 per cent of these fevers are caused by the virus of dengue, up to 5 per cent were found to be due to the virus of Japanese B encephalitis, and a smaller number to the African Forest virus. The cause of the remaining 60 per cent remains a mystery.

PÆDIATRICS

The complicated procedures now used for the diagnosis and treatment of diseases of children required the establishment of a new speciality in the Army in 1957. For pædiatrics a medical officer must have attained at least the status of a specialist in medicine. A long period of training and the appropriate higher qualifications, namely the Membership of a Royal College of Physicians and the Diploma of Child Health, are also required.

There are now pædiatric centres in Germany, Malta and the Far East with an experienced pædiatrician in charge, and they are doing excellent work both in the prevention and treatment of disease. It is hoped to have similar centres in all the important military hospitals before long. They will comprise the children's wards, a special out-patient clinic, and a consulting service. In addition to his work in the centre, the specialist in charge will visit other hospitals in the Command and be available for domiciliary visits.

The main pædiatric centre in the Far East is at the British Military Hospital, Singapore, and there are similar centres in Kinrara and Hong Kong. These hospitals admit children of various nationalities, including Australian, British, Chinese, Malayan, New Zealand and Tamil. This offers a wide scope and variety of cases rarely seen outside the larger teaching hospitals. Seven exchange transfusions for erythroblastosis were performed during the past year, and infants suffering from severe gastro-enteritis were treated by the latest methods used in the United Kingdom, including scalp vein transfusion. It will surprise many to learn that in a hospital like the British Military Hospital, Singapore,

20 per cent of all admissions on the medical side and 25 per cent of all out-patients are children. The pædiatrician is usually the busiest medical officer in the hospital.

Encephalitic illnesses are common in the Far East, especially among Gurkha children, and investigations are in progress to determine their ætiology. The acute respiratory disease of Gurkha children, the cause of which has hitherto been obscure, is now considered to be a form of encephalitis. The surgery of children's diseases has not lagged behind and many operations have been performed there, including those for such conditions as imperforate anus, duodenal obstruction and œsophageal atresia.

In Malta the Army is also responsible for the care of the children of the Royal Navy, Royal Air Force and Royal Malta Artillery, and the pædiatric centre is a very busy one. Infantile gastro-enteritis is common and severe complications occur. The pædiatrician has been most successful in the treatment of these cases and a special unit has been designed to minimise the possibility of cross infection.

In Germany there is a pædiatric centre in the British Military Hospital, Iserlohn. This caters for a large number of children. In Cyprus also the pædiatric centre is very busy and much valuable work is undertaken. Plans have been drawn up for centres at The Queen Alexandra Military Hospital, Millbank, and at the Cambridge Military Hospital, Aldershot.

Thus the youngest speciality in the Army Medical Services, born but a year ago, is already beyond the adolescent stage. The aim is to have pædiatric centres of the latest design and equipped with everything necessary for the efficient diagnosis and treatment of diseases of children, wherever the need should arise.

DERMATOLOGY

The most striking advance in military dermatology in the last ten years has been the reduction of skin sepsis. Thus, the incidence of impetigo and pyococcal skin infections in the Middle East fell from 78 per 1,000 per annum in 1949 to 31 per 1,000 per annum in 1953. That this result has been achieved is due mainly to two things. First there is the emergence of antibiotics, such as aureomycin, terramycin, neomycin, gramicidin and bacitracin, all of which can be safely applied to the skin. These are almost free from the sensitivity reactions which so often resulted from the sulphonamides, penicillin, streptomycin and chloramphenicol, and also from the potential light sensitising properties of the sulphonamides. Neomycin, gramicidin and bacitracin possess the additional advantage that they are seldom used systemically, and therefore the production of resistant strains of organisms as a result of their use is less likely to occur. All this, combined with the fact that some of these antibiotics are safe and effective when given systemically in skin diseases, has resulted in a marked fall in hospital admissions for pyogenic infections of the skin, and an increased facility of treatment of those eczematous conditions in which bacterial sensitisation or infection plays a prominent part. Second, the investigation carried out by

Odbert, Archer and Squire among troops in the Middle East in 1951 and 1952 (Squire, 1953)¹ emphasised the importance of efficient arrangements for early dressing of cuts and abrasions, and of facilities for carrying out an aseptic technique of dressing in medical centres if the full benefit of these new antibiotics is to be reaped. This work and the implementation of the recommendations arising from it have played an important part in the reduction of skin sepsis in the Army.

In the Far East, in the years 1947-1949, a dermatological research team of the Royal Army Medical Corps made a large-scale investigation into skin disease, especially fungous infections, which occurred in epidemic form in the Far East at that time. Two facts were established. Firstly, that this epidemic was most unusual on account of the high incidence of *Trichophyton mentagrophytes* infections, and secondly, that strong evidence was produced to suggest that the fungus was brought from England on the feet of soldiers as *T. interdigitale*, which as a result of tropical environment mutated to the closely allied subspecies *T. mentagrophytes*. This work, though it provided no dramatic short-term prophylactic measure, indicated lines of rational treatment, and provided suggestions for prophylaxis and for further research.

The corticosteroids have been a great blessing to the dermatologist and have sometimes been life-saving in exfoliative dermatitis, other severe eruptions due to drugs, and in severe cases of erythema multiforme (Stevens-Johnson syndrome). They have also been of great value in selected cases of eczema, and although not normally used in self-limiting allergic conditions, they might have some application in military medicine in enabling key personnel, at a critical juncture, to remain at their posts.

VENEREOLGY

In the field of venereology, the changes which had begun in 1944 with the introduction of penicillin as the standard treatment of early syphilis and gonorrhœa have revolutionised venereal practice. The almost complete omission of trivalent and pentavalent arsenic in the management of syphilis has made treatment both safer and more expeditious, and the fears that drug resistance of *Neisseria gonorrhœæ* to penicillin would develop on the same pattern as had been experienced with the sulphonamides have not been realised.

The development of the Nelson's treponema immobilisation test and the treponemal Wassermann reaction have done much to solve the problems of diagnosis and control of late, latent, and congenital syphilis, and the establishment of a complement fixation test adjuvant to, but not replacing, Frei's skin sensitivity test has proved of value in the diagnosis of lymphogranuloma venereum.

In sharp contrast to the world-wide fall in the incidence of early syphilis and gonorrhœa since the peak year of 1947 has been the increase of non-gonococcal urethritis. The returns of the Ministry of Health for England and

¹ Skin Disease (including Septic Skin Conditions), Middle East Land Forces, 1949-1952, by J. R. Squire. Confidential Report to the War Office.

Wales show an increase of 32 per cent from 1951 to 1955. The ætiology of the disease is not known, but the condition is an important one in that some 3 to 4 per cent of cases develop Reiter's syndrome. Topical steroid therapy has proved of value in Reiter's syndrome, though the results of general therapy have been disappointing.

PHYSICAL MEDICINE

The "rehabilitation approach" has been one of the main advances in the speciality of Physical Medicine during the past decade. It is now recognised that for maximal recovery from illness and injury in the shortest time, a positive and purposeful approach is necessary in all medical and surgical treatment at all stages. To bring treatment fully into line with this modern concept, an Army Medical Rehabilitation Unit has taken the place of the convalescent depot. To this unit those long-term cases, mainly orthopædic, with greater or smaller degrees of disablement persisting after definitive treatment, are transferred from hospital as soon as possible.

Electro-diagnosis in neuromuscular disorders is rapidly expanding. It is making an important, often a decisive, contribution to the elucidation of problems of diagnosis and prognosis which often confront not only the specialist in physical medicine but the neurologist and the orthopædic surgeon. The Army has now two fully equipped departments, one in the Medical Rehabilitation Unit at Chester and one in the Royal Herbert Hospital, Woolwich.

The past decade of military medicine has been made notable by the achievements of our officers in all branches of their profession, and by their efforts to alleviate suffering and cure disease. But they are not resting on their laurels; work is going on in all parts of the world on various research projects, and if one dares to take a glance into the future, one can do so with confidence that the Royal Army Medical Corps will continue to play its part nobly.

A DECADE OF SURGERY IN THE ARMY

BY

Major-General J. HUSTON, Q.H.S., M.B., Ch.B., F.R.C.S. (Edin.).

Director of Surgery

DURING the past ten years, surgical cover has been provided for several localised wars and for our policing commitments overseas, albeit with some difficulty; for in 1948 the Corps began to feel the loss of a number of its more experienced younger war-time surgeons, some of whom were of consultant status. In consequence efforts had to be redoubled to ensure the continuous training of our young Regular surgeons to take their place.

Difficulties were met in the selection and placing of officers, particularly overseas, and as far as possible those showing early promise were helped by postings to suitable hospitals where they could obtain further surgical experience and gain the higher qualifications required. The strain on Regular officers has been considerable and studies have often had to be interrupted by posting

overseas, where many have found themselves the sole surgical opinion in isolated garrisons for months on end.

Training

Versatility and adaptability based upon wide experience are the chief attributes of a military surgeon and his training must be arranged accordingly. It is essential to provide a sound groundwork of general surgery and, above all, experience in the surgery of trauma in its civilian and military aspects. He must have up-to-date experience in the emergencies of the more recent branches of specialised regional surgery, notably for head, chest and urological conditions, in order that he may be competent to deal with them on his own.

Special centres

Early in the decade under review, a number of specialties had become better defined with the growth of knowledge particularly in thoracic, neuro-surgical, orthopædic and pædiatric problems. This specialisation, the aim of which is to provide improved facilities for investigation and treatment, has been encouraged in the Service by the increased adaptability, speed and range of air transport. In the Army, the helicopter has brought the patient from the regimental aid post or the scene of an ambush in the jungle to a surgical centre with modern facilities for specialised treatment, within minutes or hours.

To meet the needs of these new specialised surgical fields, a chest centre, a head injuries unit, an orthopædic centre and special units for pædiatric and urological cases, all under military control but working in close collaboration with civilian institutions, have been established. In these our patients are afforded a high standard of investigation and treatment, and by attachment in turn to such centres for training, our military surgeons can gain the necessary experience in specialised techniques to enable them to deal with the emergencies of regional surgery that may confront them in isolated situations.

Equipment

Scales of surgical equipment for field units have all been reviewed and modernised. Emphasis has been placed on the need to reduce bulk to meet the logistic needs of modern warfare. In this we have benefited by the advice of many eminent colleagues of the last war, and it is felt that we are now better equipped and prepared than ever before.

Central sterile supply departments have been organised in most military hospitals. Beginning as a sterile syringe service, they now provide sterile standard packs of dressings and surgical instruments for routine procedures in hospitals and also supply the needs of medical centres in the district. This has relieved the burden in operating theatres and has resulted in greater general efficiency and safety. The aim is to eliminate steel drums as containers, thereby saving space and expense.

Wound dressings

A number of materials have been tried for dressing burns and wounds at the Cambridge Military Hospital and elsewhere. Large bulky dressings, although absorbent, are uncomfortable and tend to macerate the underlying

tissues. The adherence of gauze to proliferating epithelium and to skin grafts is a disadvantage of textile dressings. Trials have been conducted of modern ventilated, non-adherent plastic materials to diminish this tendency, and considerable attention has been given to the question of the reduction of bulk for the comfort of the patient and also to save storage and carriage space. The use of air-permeable but water-proof adhesive plaster has been adopted for minor wounds with success. There is no doubt that daylight, coolness and dryness are important factors in the control of wound infection, and the use of transparent plastic wound dressings which can be applied from a distance by spraying has shown promising results.

Emphasis has also been placed on the insistence of a "no touch" technique in applying surgical dressings, whether in medical centres or in ward dressing rooms. The methods are taught by sister tutors to all nursing orderlies and demonstrated by visual aids.

Wound shock

It is well established that if a blood volume of less than 75 per cent of normal persists for longer than about half an hour, a state of "irreversible shock," usually fatal, ensues and, even in cases apparently successfully resuscitated, post-traumatic renal failure develops later. The importance of these considerations has become more widely appreciated in recent years and the clinical estimation of blood loss and of wound volume, swab weighing and the measurement of the swelling in injured extremities have been more consistently used.

Throughout the terrorist activities in Malaya from June, 1948, in the Korean War of 1950-53 and for the casualties occurring in Cyprus, the severely injured were transfused, with notable success, with much larger quantities of blood than would have been thought advisable before 1948.

Whilst statistics must be examined with regard to the variable local factors, it may be of interest to record that the death rate for casualties admitted to medical units on the Western Front in the First World War was 7.5 per cent; in North-West Europe in 1944-45 it was 6.8 per cent, despite modern advances in transfusion, antibiotics and anaesthesia. This was because better deployment of medical units and the use of air transport allowed many seriously wounded to reach surgical centres alive and in salvable condition who, in the First World War, would certainly have died. Thus the great development in recent wars is that the wounded man has a better chance of survival.

In Malaya, despite the problems of the extensive and difficult terrain, far from hospitals, deep in the hills and jungle, many seriously wounded men recovered. Immediate skilled first aid with emphasis on efficient splinting, rapid evacuation to hospital, often by air, followed by adequate transfusion before, during and after operation, achieved this result. Notwithstanding the difficulties, the overall mortality in these operations was only 6 per cent and the operative mortality in military hospitals 3.3 per cent. In the Korean conflict of 1950-53 where whole blood was available in ample quantity and the use of helicopters was possible for casualty evacuation, only 2.5 per cent of wounded admitted to medical units died.

An unusual feature arose in the management of surgical casualties in the Suez operation of November, 1956. During the early hours of this brief episode, a surgical team was accommodated in an aircraft carrier and was in position to receive major casualties soon after wounding. Helicopters took personnel from the carrier to the assault areas and then lifted the wounded collected at the regimental aid posts before returning to the ship. In such circumstances, a higher operative mortality must be expected since almost every patient, however severely wounded, is given a chance of survival, whereas with slower transport and longer lines of evacuation, many such cases would die outside a medical unit, giving a higher rate of "killed in action."

The emphasis in recent years on the need for increased quantities of blood raises difficult problems regarding its provision and storage and the urgent consideration of the provision of satisfactory blood substitutes.

Burns

Soldiers are more liable to sustain burns than civilians. Apart from those caused by enemy agents such as incendiary or napalm bombs and flame-throwers, conditions of cold and fatigue under field conditions give rise to an increased incidence of accidental burns from heating and cooking apparatus. In the Korean War (1950-53) there was a "burns season" which coincided with the extreme cold weather, and here lessons were learned in the treatment of accidental burns. After resuscitation by intravenous therapy at the forward medical centre, careful toilet using sterile soap or cetrimide solution was carried out. Penicillin was given systemically as early as possible and continued for five days. Where possible, exposure technique was adopted. A decision had to be made as to whether these patients should be held for healing in the communication zone in Korea or evacuated for grafting and healing to the general hospital in Japan. Despite the use of turning frames, it was found unwise to transport cases of burns on an exposure régime as they arrived at the general hospital five to seven days after the original toilet, with the crusts or eschars broken and the burns infected. All cases for transportation therefore had dressing cover, and travelling in this way they were more comfortable, infections were fewer, and frequently after arrival at the general hospital they were re-exposed with success. They were treated in separate burns wards in cubicles to minimise the occurrence of cross infection.

Spinal conditions

Service patients frequently suffer from low back pain, lumbago, fibrositis, sciatica, prolapsed intervertebral disk and neurosis. A history of old injury is not infrequent. Backache associated with restricted spinal movement and muscle spasm raises the possibility of tuberculosis, ankylosing spondylitis, osteo-arthritis and neoplasm, and it is fortunate that Service personnel tend to come under medical observation early. This was noted in a series of 36 spinal cord tumours studied at the Military Hospital, Wheatley, and the difficulties in early diagnosis were also reported.¹

¹ BLOOM, H. J. G., ELLIS, H. & JENNETT, W. B. (1955). *Brit. med. J.*, 1, 10.

The early care of spinal injury and paraplegia is an important part of Army surgical work because of initial problems of transportation and the need of the patient's eventual rehabilitation as a useful member of the community. Regular turning of patients from the outset is an undoubted advance in the prevention of pressure sores, which used invariably to follow immobilisation in plaster beds. Turning frames have now been provided at the main hospitals and patients are turned at least every two hours on their journey from home or overseas hospitals to the Neurosurgical Unit at Wheatley. Here care may include the acute stage with reduction of a fracture and perhaps laminectomy, the aim being to make the paraplegic patient ambulant and independent as early as possible by re-education in muscle control, with an intact skin and uninfected urine, before he is transferred to the National Spinal Centre for further occupational training. The clinical records maintained at the Neurosurgical Unit at Wheatley comprise a unique series of cranial and spinal injuries in military personnel and form a basis for research which is being actively pursued.

Bone and joint conditions

A price paid for the vigorous physical training undergone by soldiers, such as assault courses and parachute dropping, is a high incidence of injury to bones and joints. To deal with these injuries, the Army Orthopædic Centre has been established at the Royal Herbert Hospital, Woolwich, where there is the advantage of a department of physical medicine and where the Army schools of physiotherapy and radiography are conveniently located with benefit to the patients, staff and students.

The treatment of fractures has seen a definite trend towards earlier and more frequent operative exposure to obtain accurate anatomical reduction and fixation where necessary with bone plates and screws or intramedullary nails, with a shorter period in hospital and improved functional results.

Injuries to the knee and ankle are common in Service personnel and results of treatment have been very satisfactory : for example, "internal derangement of the knee joint" accounted for 2,698 admissions to military hospitals in 1953-54 ; of these, 1,739 were subjected to menisectomy and only 34 required subsequent discharge from the Army. Recurrent dislocation of the shoulder joint, a not infrequent condition in soldiers, has been treated by the Putti-Platt operation with excellent results, the patients regaining full fitness for further service.

Pyogenic and tuberculous infections of bones and joints have shown a decline in incidence : hæmatogenous osteomyelitis is now a rarity. With early diagnosis and the use of modern chemotherapy, the classical appearances are nowadays seldom seen.

Peptic ulceration

In 1954-55 there were 3,150 admissions to military hospitals for peptic ulceration among military personnel. There were five deaths and 927 patients were invalided from the Service for this condition. It is a serious matter for the individual and for the Army if a soldier with peptic ulceration requires invaliding ; for the individual, because adaptation to a new occupation may cause further

worry—a bad companion in the ulcer-prone ; for the Army, by losing an experienced, skilled man, often with a long and costly technical training behind him. A review of some of the Army patients who had undergone partial gastrectomy for the condition between 1950-54 has been carried out.² In a study of 181 patients, more than 75 per cent of them remained fit for service in the Army and 60 per cent of these were fit for full active service duties in any part of the world. No single type of surgical procedure is suitable for all cases, but where the accepted indications for surgery are present, good results can generally be expected.

Tuberculosis

Pulmonary. Since 1953, thoracic surgery for selected cases of pulmonary tuberculosis (and other conditions) has been undertaken at the Connaught Military Hospital (Army Chest Centre), Hindhead. Following an adequate period of bed-rest and chemotherapy, segmental resection or a more major excision of lung tissue is carried out.

Lung surgery for tuberculosis has undergone a marked change over the last eight years. Earlier the approach was that certain cases with well-defined characteristics were looked on as suitable for resection ; the others were treated medically or subjected to some form of collapse therapy. The usual pathological indications for resection were : solid disease of more than 2 centimetres in extent, persistent cavities, bronchial stenoses, tuberculous bronchiectases, failed artificial pneumothoraces or thorocoplasties and tuberculous empyemata. Bilateral infection was resected only if it was strictly localised and confined to one lobe. Latterly, surgical removal of the diseased area or areas of lung has been regarded as the treatment of choice in all except where the disease is too extensive to allow it, or too minute to make it worth while. The limits set by the extent of the disease have been extended and larger areas of lung are now removed at operation than was once thought feasible. The upper lobe, including the lingula and the apical segment of the lower lobe on the same side, can be removed in young people, with adequate filling of the hemithorax by the remaining segments. Bilateral resections are also carried out provided the disease on either side is resectable. As regards “minimal lesions,” which in the past many preferred to leave alone, with or without a course of medical treatment, the tendency now is to resect them if they show radiological evidence of anything more than minimal fibrous scarring.

Recently, tuberculous patients have been offered resection sooner than was formerly thought wise. With negative sputum and uncavitated lesions operation is done six to ten weeks after drug treatment has begun. Post-operative anti-tuberculosis drugs are continued longer than a year or two ago—usually for up to one year after operation.

Resection is a safe operation. Without it, apparently healed lesions frequently contain tubercle bacilli. From a psychological and economical standpoint it is advantageous to attempt eradication of the disease by surgery in our

² HUNT, R. S. (1957). *J. roy. Army med. Cps*, 103, 4.

Army patients (most of whom are under 30), rather than indulge in prolonged chemotherapy. Patients, after uncomplicated resections, get up shortly after operation, are discharged thirteen to fourteen weeks later and return to light duty at twenty-one weeks after operation.

Retention in the Army of some affected Regular personnel after cure is now possible. The surgical trend has been away from thoracoplasties, which are now done in few cases. Rib resection and the drainage of empyemata, once a common operation, is also now a rarity.

Conclusion

Some recent trends in Army surgical practice have been reviewed. The rapid technical progress of the last ten years has given us a better understanding of surgical shock, a growing knowledge of body fluid and electrolyte disturbances, outstanding advances in anæsthesia, a more discriminating use of antibiotics and chemotherapeutic agents, improved methods of preserving blood and other living tissues *in vitro*, better methods of securing hæmostasis and bone fixation, all of which have made the surgeon's task easier and safer with better end results : but there is still much to learn.

What wound did ever heal but by degrees? (Othello, Act II, Scene iii).

THE ARMY HEALTH ORGANISATION, 1948-1958

BY

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A REVIEW of military hygiene in the British Army during the first fifty years of the Royal Army Medical Corps appeared in the Golden Jubilee number of this Journal (Richmond, 1948). It is the object of this article to continue the chronicle by presenting a survey of the ten years immediately preceding the Diamond Jubilee.

A task which faces all Service branches during post-war years is the study of lessons learned during war. The standard of hygiene in the British Army has greatly improved during, or as a result of, every past war. This has been due partly to the discovery and application of new techniques; in World War II, residual insecticides, new insect repellents, miticides, the chemoprophylaxis of malaria and the sulphonamide drugs revolutionised many aspects of disease prevention. Important though these new discoveries were, there was another factor of even greater importance and that was the replacement of the apathy of regimental and staff officers by enthusiasm for hygiene. This was the main hygiene lesson of World War II, just as it was the main hygiene lesson of World War I, the South African War and the Crimean War. That this lesson is easily and quickly forgotten is amply proved by history.

New discoveries of potential benefit to the soldier's health are of little value unless they can be translated into effective action. Almost without exception,

such action must be taken by regimental, as opposed to medical, personnel; therefore health education is of fundamental importance.

During the last ten years considerable efforts have been made regarding health education in the Army. In 1948, hygiene subjects were introduced into the entrance examination for the Royal Military Academy Sandhurst, and into exercises at the Staff College, Camberley. In 1950, the Director-General, Army Medical Services stressed the importance of health education by delivering a lecture on "health discipline" at the Staff College; he also contributed to the literature on the subject (Cantlie, 1950).

Organising health education is now one of the primary tasks of specialists in Army Health. To aid them in this task, new films dealing with personal and communal hygiene were released in 1950, film strips were produced at the Army School of Health, and Mobile Health Training Teams were devised. A great deal of thought has been given to the various educational techniques involved (Sloane, 1951). New pamphlets have been produced, "Your Health and You" (War Office, 1950), to help the individual soldier, and for his family, "Health in the Tropics—Notes for Families" (War Office, 1957). The lessons of World War II have been incorporated in the Handbook of Army Health and in the Manual of Army Health (War Office, 1950 and 1954).

In 1948, courses were commenced at the Army School of Health to train as health educators regimental officers and N.C.Os. of Army Basic Training Units (A.B.T.U.s.). Continuation of health training, commenced at A.B.T.U.s., was given prominence in an Army Council Instruction issued in 1953, and courses are now held at the Army School of Health to train unit officers and N.C.Os. to take part in this continuation training. Prominence has also been given to the need for the health education of troops proceeding on overseas service; since 1948, lecturing on health to troops during voyages has been an official duty of the senior medical officers of troopships (Sloane, 1950).

The results of health education are not easy to judge in peace time when the majority of troops occupy permanent barracks with a well-controlled environment. However, during the last ten years, the campaigns in Korea, Malaya, East Africa, Suez and Oman have provided scope for testing the health knowledge of regimental personnel and their ability to apply it in field conditions.

The operations in Malaya provided confirmation of the importance of health discipline, and the health record of the Brigade of Guards in that theatre was impressive (Scott & Stalbow, 1950). Experience in jungle warfare had already been acquired in World War II, and many hygiene lessons had been noted (O'Dwyer, 1949). Malaria has now ceased to be a serious cause of loss of military manpower, but it must be noted that practically all the relevant preventive measures rely upon the actions of regimental personnel (D'Arcy, 1948). Scrub typhus, a comparatively new disease of armies, was conquered by prevention and therapy soon after its recognition, so that our troops in Malaya were well protected (Audy, 1949).

In Korea the problem of preventing injuries due to cold were successfully solved, mainly by a scale of efficient clothing coupled with good individual

discipline; casualties from frost-bite and trench foot were negligible (Watts, 1952; Bretland, 1954). The record in regard to less novel hygiene matters was not so satisfactory; basic principles of hygiene and sanitation had to be re-learned by bitter experience, and paludrine discipline was often disappointing.

From the hygiene viewpoint, the campaign against Mau-Mau in East Africa resembled the operations in Malaya. The tactical situation demanded action by small parties of troops operating in an environment which could not be controlled; because of this, hygiene depended largely upon individual self-control, or, in other words, upon personal health discipline. There was malaria and schistosomiasis to be prevented, and an epidemic of plague in the indigenous population was a hazard. The Army Health Organisation co-operated with the civil health authorities in defeating the threat of plague by spraying villages with residual insecticides; trailers equipped with spraying apparatus were used for this work. Some of the rather unusual hazards included tick-typhus, to which troops on cattle protection duties were exposed, altitude sickness when on operations at heights of 10,000 feet or more, and attacks by elephant and rhinoceros.

The "Suez crisis" provided evidence that the standard of health knowledge of regimental personnel, both rank and file and their leaders, had declined since the end of World War II; already the lessons learned in war were being forgotten in peace. The shortcomings noted were all concerned with the basic principles of hygiene: the prevention of ingestion diseases, personal hygiene, especially care of the skin, and the avoidance of heat effects. In addition it was demonstrated that hygiene personnel and units, with adequate equipment and supplies, are a vital need in areas wherein public health and associated services have ceased to function (Archer, 1958 b).

In the Oman campaign there was evidence of a high standard of hygiene in relation to food, messing and waste disposal. There was not a single case of dysentery throughout this campaign; only one case of diarrhoea occurred, and that was considered a relapse from a previous infection. This excellent record appears all the more remarkable having due regard for the fact that houseflies abounded and, due to constant movement, "cat sanitation" only was possible. This was one aspect of hygiene the troops seemed to understand and most forcibly illustrated the value of training and hygiene discipline. However, there were lessons to be re-learned in regard to other matters, notably water discipline, the avoidance of heat effects, the need for scrupulous personal cleanliness in the prevention of skin infections, and the fact that both internal and external otitis are exacerbated by desert conditions (Binns, 1957).

In 1948, the Military Personnel Research Committee was restored, and in 1950 it was reorganised. Its subcommittees deal with clothing and personal equipment, environmental physiology and information and ascertainment of problems. R.A.M.C. officers have carried out investigations under its ægis, into the physiology under stress in cold conditions in Canada, in the front line in Korea, in the Falkland Islands and in Antarctica. Investigations have also been carried out regarding the physiological problems of hot climates, par-

ticularly in collaboration with the Royal Navy at Singapore. Research in relation to clothing and equipment has involved trials of load carrying and new ranges of clothing for combat, jungle and winter warfare (Lippold & Naylor, 1951; Renbourn, 1954). The routine use of air transport for the speedy conveyance of troops over long distances and between countries with extreme climatic differences raises problems involving the physiology of air travel and acclimatisation to hot climates. Special studies are therefore being made of all the factors which affect the health, efficiency, comfort and morale of troops transported by air. In particular it is essential to ensure that such troops arrive "fighting fit" at their destinations. The factors involved include the effects of diminished oxygen tension, atmospheric pressure changes, motion sickness, postural œdema, temperature and humidity changes, noise and vibration, upsets in diurnal rhythm and air-travel fatigue generally; associated with these factors are such matters as the design and spacing of seating, facilities for the stowage of personal equipment, toilet facilities, supplies of food and water, additional oxygen supplies, health education, indoctrination, and the international control of disease. In addition, the basic principles of hygiene during travel must be stressed; it is not unknown for troops to be rendered non-effective after arrival on account of food-borne infection acquired *en route*. Much knowledge and experience have already been acquired regarding acclimatisation to hot climates. Attention is now focused on questions as to whether the acclimatisation process can be accelerated, and whether artificial acclimatisation can be usefully and permanently achieved before leaving a temperate climate. Although there is laboratory evidence that the required physiological changes can be artificially induced, the practical application of this evidence has yet to be fully investigated.

The medical aspects of physical training were reviewed in 1950 by a special committee. Such training is an integral part of the work to promote the soldier's physical and mental health, and the results of physical efficiency tests provide a useful guide as to the fitness of troops for active service. Here it is relevant to pay tribute to the Physical Development Centre at Chester which closed in 1948; in the war years it made an important contribution to the efficiency of the Army, and a unit of this nature is acknowledged to be very necessary in war time.

Improvements have been made in our ability to measure physical and mental efficiency, and to state those measurements in a form easily utilised by all who have to select, lead and administer troops (Devlin, 1952). In 1948, the Inter-Departmental Committee on the Creation of a Uniform System of Medical Categorisation for the Fighting Services completed its work and was dissolved. The resulting change-over to the PULHEEMS system was speedily and smoothly accomplished in the same year.

The increasing complexity of military equipment has made it necessary for the Army Health Organisation to increase its activities in the field of industrial hygiene. The Joint Services and Factory Department Committee on Occupational Health continues to be a valuable medium for the pooling of relevant knowledge and experience. Protection against radiation hazards is receiving

special attention, and the Army film badge service has been officially recognised by the Chief Inspector of Factories. As a result, the Army film badge service is now a legally approved "laboratory" within the meaning of the Luminising Regulations ; the only other legally recognised organisation in this context is the national Radiological Protection Service. The increasing use of radioactive substances in industry has made necessary new regulations under the Radioactive Substances Act ; these apply to all sources of radioactivity and not only to luminising processes. The official recognition of the Army film badge service carries with it the obligation of compliance with these regulations.

In addition to the industrial aspects of radiological protection, the Army Health Organisation is concerned with the problems associated with radioactive contamination of food and water, with the disposal of radioactive wastes and with the storage of sources of radioactivity used for training purposes. There is considerable scope in the Army for statistical research on the subject with particular reference to "whole life" radiation dosage. The fact that the Army operates maternal and child welfare centres, a school health service, an industrial health service, a general medical service and a public health service would facilitate the collection of such statistics from a wide field, and in addition their relation to diseases such as cancer and leukæmia and to possible genetic effects.

In the immediate post-war years food rationing problems made it necessary to conduct investigations regarding the soldier's energy expenditure and calorie intake. The investigations carried out in the period 1948-1950 revealed that the soldier was purchasing 900 calories-worth of food daily out of his own pocket and that, in some instances, his ration scale was lower than that of a comparable civilian. Since those days considerable improvements in the ration scales have been effected, and similar investigations are continuing.

Our techniques for purifying drinking water in the field have been further developed. An important advance has been the adoption of fixed-dose chlorination combined with the neutral red test ; this has involved replacement by the Elliott Case of the familiar Horrocks Box, which performed such sterling service for so many years. In 1948, the Inter-Service Advisory Panel on the Treatment of Water Supplies in the Field came into being, and has proved of great benefit to all concerned. In addition, new patterns of water vehicles, lightweight filters and new sterilising compounds have all contributed to making the soldier's drinking water safer than it has ever been (Elliott, 1949 and 1957 ; Anderson, 1949).

The advent of residual insecticides has revolutionised our ability to prevent insect-borne diseases. New insecticidal preparations and means for their application have been tested in the field and at the Army School of Health. Improved preparations of D.D.T., B.H.C., and dieldrin, together with new types of sprayers, aerosol dispensers and fogging apparatus, have greatly simplified the task of destroying the insect vectors of disease. Since 1948, the Director of Army Health has been a member of the Colonial Insecticides Committee which provides valuable opportunities for exchange of knowledge of the subject. These advances, together with better repellents and miticides and the replace-

ment of mepacrine by paludrine in the chemoprophylaxis of malaria, have reduced the hazard of insect-borne disease to a fraction of what it was before (Keatinge, 1949 ; Smart, 1952 ; and Dowling, 1955 a, b).

Increasing attention has been paid to the health of Army families and a considerable amount of the work of the specialist in Army health is now devoted to this subject (Maitland, 1950). The Education Act of 1944 and the National Health Service Act of 1946 resulted in Army families becoming entitled to medical care which formerly they received as a privilege. In 1948, Senior Medical Officers of the Ministry of Education toured B.A.O.R. ; an extract from their report is as follows : "In our judgment the arrangements made or contemplated are such as ought to provide a really efficient school health service and they reflect great credit on the R.A.M.C. We were stimulated by the enthusiasm and ability and broad humanity of the officers of the R.A.M.C., and we were impressed by their keenness to set up a school health service that would compare favourably with that of the most progressive areas in the United Kingdom" (War Office, 1952). The work performed by nursing sisters of the Soldiers', Sailors' and Airmen's Families Association (S.S.A.F.A.) is worthy of special note. In the military community, S.S.A.F.A. sisters perform the work of domiciliary health visiting, domiciliary nursing and school health visiting. In addition, they operate maternal and child welfare clinics and carry out numerous other duties associated with the health and welfare of military families. In 1955, the military family community consisted of approximately 22,000 wives and 34,000 children, many being located overseas in environments having health problems unfamiliar to residents in the United Kingdom. In that year S.S.A.F.A. sisters made 71,603 domiciliary visits and received 75,000 clinic attendances. The services of S.S.A.F.A. sisters are not confined to U.K.-based families, but are extended to cater for the families of locally enlisted troops in Malaya and elsewhere. Domiciliary visits are also made by specialists in Army Health pursuing epidemiological and environmental investigations ; such visits are co-ordinated with those made by clinical specialists when occasion demands. The admission of service wives to hospital raises urgent domestic problems in relation to the care of their children, especially overseas when the husband, or other relative, is not at home to help. In some theatres this problem has been solved by the establishment of crèches, mainly through local initiative supported by S.S.A.F.A. sisters and Army Health specialists. Medical advice has been prominent in the recent efforts to improve living conditions for Army families, and their accommodation has been the subject of special study (Burbridge, 1954 ; Devlin, 1954).

Progress has been made in relation to barrack accommodation, and the Army Health Organisation has contributed to this. Because of financial limitation, progress has seemed slow but, in retrospect, it can be noted that much has been accomplished in the last ten years. Hospital and medical centre accommodation has been improved also. Army health specialists have made a special survey of the latter, and attention to the standard of service provided is now within their terms of reference. The modern medical centre is very different from the old-

style medical inspection room, the aim being to provide the highest standard of general practitioner service (Youngson, 1956).

Now that most of the epidemic diseases of the past have been brought under control, skin diseases have emerged as the most important single cause of hospital admission. In all Commands except the Far East, the common skin condition has been septic infection of minor skin injuries. In the Far East fungous infections have been more common than septic infections (Davies, 1952). In 1948, a dermatological team investigated fungous skin infections among troops in the Far East, and revealed that the infecting fungus originated in the United Kingdom, accompanied the troops in their journey overseas, and multiplied rapidly in the hot, humid climate. In 1952 dermatological research was conducted in the Middle East. It was demonstrated that the common infecting organisms were staphylococci and streptococci originating in the patient's own skin, nose and throat. No specific measures are available for the prophylaxis of these conditions. However, there is scope for improving prophylaxis based on general measures and personal hygiene involving the use of soap, water and ventilation of the skin; improvements in this respect might make specific measures superfluous.

Our arrangements for the control of tuberculosis have been improved, particularly in regard to follow-up of contacts. The Army Health Organisation has been co-operating with the Medical Research Council in a trial of B.C.G. vaccine by the follow-up of subjects during their military service. A special study has been made of the incidence of pulmonary tuberculosis in Gurkha troops and their families, and, as a result, measures have been instituted to hasten the elimination of this disease. During 1948 and 1949, details of this important public health problem were accumulated, and in 1950, the examination of all Gurkha troops by mass miniature radiography (M.M.R.) was commenced. These M.M.R. examinations are applied to all personnel of the Gurkha Brigade, and surveys of entire Gurkha units have been carried out. Gurkha recruits are examined by full plate X-ray in India before acceptance, and this has been extended to cover their families, teachers, priests and midwives. Heaf testing, with B.C.G. vaccination of negative reactors, has been performed as a routine since 1951. Eradication of sources of infection, by improved facilities for the treatment of the disease among Gurkha troops, has been allotted priority since 1952. Treatment includes, according to the needs of each particular patient, at least two years' drug therapy at sanatoria specially established for Gurkha troops, thoracic surgery at the Army Chest Centre in England, and up to nine months at the Rehabilitation Centre in Malaya. Similar facilities are afforded for the families of Gurkha troops.

Other specific diseases which have been the subject of special study include acute hæmorrhagic fever in Korea, Weil's disease and Japanese B encephalitis in Malaya, enteric fever in the Middle East and influenza of world-wide distribution. Also, infective hepatitis has continued to attract special attention as it did during the war years (Richards, 1950; Archer, 1954).

The ten years under review have witnessed a decline in the overall incidence

of disease in the Army. The rate for malaria in the Middle and Far East is now approximately the same as that for psychiatric disorders (approximately 4 per 1,000 per annum). Even the old "camp disease," bacillary dysentery, now causes little concern except in the Middle East, where, although the incidence has been halved since 1948, it is still an important medical cause of manpower wastage.

The rate for venereal disease in B.A.O.R. is now one-tenth of what it was in 1948 ; only in the Far East has the reduction in the incidence of this disease been less dramatic. The trends in respect of respiratory and skin infections were not so well defined, there having been wide fluctuations between the experiences of the various years; however, these diseases also show a general but undramatic decline.

The Army Health Organisation is not preoccupied solely with the prevention of disease ; continuous efforts are made to improve the quality of health itself. This "positive health" outlook has been given prominence in the post-war years (Burbridge, 1949). In addition, attention has been paid to problems of mental health and morale concerning which specialists in military psychiatry and specialists in Army health work in close collaboration. The Army Health Organisation now has a definite and official responsibility in this field (Lewis, 1951). The use of the word "hygiene," although etymologically by far the most appropriate, did not, in popular parlance, express the full scope of the specialty in the Army ; hence, in 1949, the Army Hygiene Organisation was re-named the Army Health Organisation (Scott, 1951).

The Organisation provides services similar to those of a Local Health Authority, particularly overseas and with reference to families ; also, it has some of the functions of a Regional Hospital Board and a Local Executive Council, besides operating School Health, Industrial Health and Port Health Services (Ingham, 1952).

In conclusion, the work of the Army Health Organisation in the years that lie ahead will be briefly summarised. The ascertainment of problems, and practical solutions to them, must continue, as must also the search for new facts upon which further improvements in the soldier's health and efficiency may be based. Army health specialists must continue to explore the health aspects of the diverse environments wherein the soldier may be employed ; such explorations have been conducted recently in jungles (Archer, 1958 a) and in Antarctica. The exchange of Army health specialists with medical officers of other armies will extend the scope of our experience ; arrangements are being made for an Army health specialist to be exchanged with a specialist of the Pakistan Army Medical Corps, and it is anticipated that similar exchanges will follow. More knowledge must be acquired regarding acclimatisation to hot environments, the physiology of air travel, the hazards of rockets, other new weapons and nuclear radiations. The fact that the Director of Army Health is Chairman of the Working Party on Radiological Protection will assist our progress in this latter field.

Although new developments and research are important, there is great scope for enhancing the health and efficiency of the Army by improving the practical application of the basic principles of hygiene ; health education, in its widest sense, is our main instrument for achieving this. The organisation

for health education in the Army has great potentialities, and involves teamwork in which all ranks, irrespective of trade, grade or mode of employment, have a part to play (Lewis, 1952). The main task of the Army in peace is to train for war; hygiene is an essential part of that training. Through health education, particularly of commanders and senior staff officers, it can be ensured that the health of the Army is in keeping with the state of medical and other scientific knowledge of the times; that is our main target for the future.

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THE ARMY PATHOLOGY SERVICE, 1948-1958

BY

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SINCE 1949 the ever-widening scope of Army pathology and the development of new techniques have necessitated many changes in all aspects of the subject to provide the fast and efficient pathology service which modern Service medicine demands.

The decade has seen memorable developments in technical equipment resulting in many additions to the authorised scales of our laboratories which now include modern colorimeters, flame photometers and electrophoresis apparatus. The Mobile Pathology Laboratory has been redesigned to fulfil present-day requirements, and attracted considerable attention when first demonstrated at the Director General's Autumn Exercise in 1957.

The Army Tumour Registry, set up at Millbank, is ten years old and is now a part of the Royal Army Medical College. It has proved an invaluable asset in dealing with malignant disease and provides with all possible speed the highest grade of specialist advice on histological matters. Specimens which have been sent by air are collected on arrival at any hour of the day or night and reports are sent to overseas centres by signal. It has also contributed much to the teaching and training of both medical officers and laboratory technicians by making available sets of slides to laboratories and individual students.

A Virology Laboratory has been added to the Pathology Department of the Royal Army Medical College and was recently in the news when it identified as Virus A the first strains of Asian influenza to reach this country, which came from Hong Kong. It is proposed to extend the scope of this laboratory to the study of diseases due to arthropod-borne viruses, and the present officer-in-charge has recently visited the United States on a preliminary period of study of this group. A pathologist has also been seconded to the Colonial Office and is now attached to the Federal Laboratory Service, Nigeria, to work on the development of 17D mouse brain yellow fever vaccine. Looking to the future, a need is foreseen for all our larger central laboratories at home and overseas to have a service capable of undertaking diagnostic work in this important and expanding subject.

In the Transfusion Departments at The David Bruce Laboratories and at our Central Laboratories overseas continuous work has been done on the design, assembly, and packing of equipment. Following recent trials, in which the Army took part, the giving set is being replaced by commercially produced plastic sets. Plastic bags in place of bottles are also to be given an extended trial in certain overseas stations.

While the Army overseas collects blood, carries out the blood grouping involved and issues special Army donor cards to the donors, in the United Kingdom the blood used in military hospitals has, with rare exceptions, been obtained from National Blood Transfusion Centres and Army donors have in

consequence been bled by these centres. Recently, however, Army blood collecting teams have been formed in Southern and Northern Commands to co-operate with the National Blood Transfusion Service in the collection of blood from military donors in the larger military stations. This affords the best possible training facilities and enables our personnel to maintain the highest standards when dealing with our overseas commitments. A further stimulus to the general training of our technicians has been given by the reciprocal recognition of qualifications which was made with the Institute of Medical Laboratory Technology.

As a result of investigations into the prevention of tetanus, the use of tetanus toxoid, as employed during the war years, has been revived in peace time for all personnel. The toxoid has also been combined with T.A.B. vaccine to be used under certain conditions as a combined prophylactic (T.A.B.T.).

Much work has been done in relation to enteric infections. The apparent failure of alcoholised vaccine, rich in the Vi antigen, to control enteric fever in spite of the improvements in health measures which had taken place, called for a comparative survey—particularly in view of the controversy on the relative merits of alcoholised and phenolised vaccines which arose following this failure of control. A field trial was therefore carried out between 1949 and 1954, but while no significant difference in effect was shown, the attack rate in the trial groups was too low for a convincing assessment. A solution to the problem was also sought in the laboratory where the relative values of the Vi and O antigens as vaccines against *Salmonella paratyphi C* infection in mice were compared. This approach led to the conclusion that, contrary to the evidence afforded by mouse protection tests against *Salmonella typhi*, the O antigen may well prove the more important. Subcutaneous T.A.B.T. has now been introduced as a routine procedure and more recently intradermal T.A.B. has been used for the third and subsequent immunising doses after subcutaneous T.A.B.T. for the first two doses. Possible developments in this ever-changing field which are now under active investigation are the exclusive use of intradermal T.A.B. or T.A.B.T. and, in view of the problem posed by mass inoculation, multipuncture inoculation with T.A.B. Of these projects, however, only the use of intradermal T.A.B. shows promise.

Poor keeping properties have always been a difficulty inherent in the use of glycerinated vaccine lymph, and on this account the Army participated in trials of dried vaccine and adopted it for routine use when the trials proved successful.

Before vaccination with B.C.G. vaccine was generally accepted in the United Kingdom, the Army adopted it for certain tuberculin-negative reactors who were at special risk. The use of this vaccine for susceptible recruits has now been extended throughout the Regular Army. The Heaf test was early adopted as a very suitable means of mass tuberculin testing.

The problem of mass immunisation and the need to develop safer methods has received much attention, the unacceptability of certain previously used methods with their attendant risk of transferring hepatitis and other infections being recognised. A prototype needleless injector has been used, but more

extended employment of this apparatus remains in abeyance pending decisions on the dose and route for administration of different vaccines. Gispén's valve, Gross's syringe, and the Fleming and Ogilvie technique have all been submitted to tests, none of which proved entirely satisfactory; the possibility of multi-puncture methods is also being fully tested.

A *Memorandum on Immunological Procedures* was published in 1952 and was well received by the medical press; a second revised edition was issued in 1956.

The use of pre-sterilised surgical packs was first advocated after the 1914-18 war but was not developed on a large scale until recent years. Central supply services are now being set up in military hospitals and the operation of this type of service calls for close and continuous co-operation from the pathologist. The possibility of diminishing the weight of sterilisation equipment intended for field use and of effecting improvements in technique is always under active consideration. The most recent investigation has been one into the efficiency of sterilisation by gaseous agents without the need for high temperature or pressure. Developments in the field of radiation sterilisation are also being studied.

Service pathologists have been engaged on a number of research projects both in their own subject and in conjunction with workers from other branches of medicine. Worthy of particular mention are the special investigation into the epidemiology of enteric fever which was carried out in the Canal Zone in 1953 and, also in the Middle East, the investigation into septic skin conditions. Other projects perhaps of more specialised interest have been carried out on rapidly induced non-specific immunity, and on comparative lethal doses of enteric organisms administered to mice by different routes; on different enzymes for the treatment of erythrocytes in the detection of incomplete antibodies; on methods of treating sputum before culture for *Mycobacterium tuberculosis*; on the keeping properties of the reagent for the Price Precipitation Reaction; on the use of membrane filters in the isolation of pathogens and on the comparative merits of the Mantoux and Heaf tuberculin tests.

Officers continue to be attached to the Chemical Defence Experimental Establishment at Porton; others have also been attached to the Microbiological Research Establishment there and a pathologist is attached to the Medical Research Council's unit at the Atomic Energy Research Establishment at Harwell; a Committee on the Medical Aspects of Nuclear, Biological and Chemical Warfare has been set up under the Chairmanship of the Deputy Director-General, Army Medical Services.

In addition to routine duties time has been found to survey the world of pathology at large, and to visit our neighbours at home and overseas. Information has been disseminated and views exchanged at annual conferences. Army pathologists have continued to attend international conferences and scientific meetings in various foreign countries and in the United Kingdom. It is also a great pleasure to record the most cordial relations which exist between our pathology service and those of the United States Forces. Each successive Director of Pathology has visited the United States, two having been invited by the Surgeon-General of the Army of the United States, to visit research units and

laboratories and attend meetings of Commissions of the Armed Forces Epidemiological Board. These visits proved as valuable as they were enjoyable.

The advice and assistance of the Army Pathology Advisory Committee which was formed in 1921 have continued to prove of inestimable value. The members, both from their first-hand experience of Service conditions and from their position in their own particular field, are especially well qualified to advise on the wide range of modern problems.

A very successful international practical seminar in clinical hæmoglobinometry, sponsored by the Association of Clinical Pathologists, was held at the Royal Army Medical College in 1957, but perhaps the most memorable event of the period was the celebration in 1955 of the centenary of Army Pathology, the foundation of which dated from instructions issued on 27th April, 1855, by Lord Panmure. This was celebrated by a dinner at the Royal Army Medical Corps Headquarters Mess on 27th April, 1955, and special commemorative articles were published in this JOURNAL and in *The Times*. By a happy coincidence the centenary of the birth of Sir David Bruce also occurred that year and this was marked by a reception at The David Bruce Laboratories, a centenary lecture delivered by Dr. Muriel Robertson, F.R.S., at the Royal Army Medical College, and by a special number of this JOURNAL.

ARMY PSYCHIATRY, 1948-1958

BY

Brigadier R. PHILLIPSON, O.B.E., D.P.M.

Director of Army Psychiatry

In the ten-year period covered by this short account of the work of Army Psychiatry the Army increased in size from 418,000 to 450,000, the Korean War took place, and the total strength of military and civilian specialist psychiatrists employed by the Army was reduced from 82 to 42. Nevertheless, by the concentration of our potential on the maintenance of mental health and the prevention of mental illness it has been possible to reduce the numbers referred for psychiatric out-patient opinion from 2.7 to 1.7 per 1,000 strength per month.

Factors contributing to this reduction are the measures which have been taken to instruct all medical officers in charge of troops in the elements of simple psychotherapy, and the close liaison maintained between Army psychiatrists and commanders at all levels, so that the contributory causes of neurotic breakdown can be eliminated. These causes are mainly due to the immature, inadequate personalities of men who have never been separated from family and home, and young married soldiers who are over-concerned about the ability of their wives to survive while they are separated.

Much depends on the type of unit in which the soldier is serving ; if in a combatant arm and at duty in an overseas command where active service or

similar conditions exist, with in consequence a sense of purpose, it is seldom that a soldier develops a psychological illness.

Young Regular soldiers tend to be referred for psychiatric examination in greater numbers than their National Service counterparts. The reasons for this are plainly the higher incidence of marriage of the young three-year short service soldier and his preoccupation with family cares. The introduction of a six-year minimum period for Regular Service in October, 1957, will reduce this problem to some extent, but, more important, the number of Regular soldiers requiring invaliding due to emotional instability and disorders of character can be expected to fall as a result of raising the standards, both physical and mental, for entry into the Army and by a more realistic approach to measures required to deal with the soldier who desires to terminate his engagement prematurely.

As measures directed towards improving the status of the Regular soldier of the future are adopted, ranging from improvements in emoluments and living conditions to the reduction to a minimum of the number of menial tasks still requiring misuse of military manpower, we can look forward to the day when less time is spent by the Army psychiatrist in the consulting room and more in visiting units to advise on problems and prevent their occurrence. With increasing facilities for family medical care Army psychiatrists, helped by psychologists and psychiatric social workers, are now enabled to treat the military family as a social group as well as the patient as a medical problem. Examples of this are seen frequently in the child who loses his stammer because the home environment, as well as the school attitude, is changed by explanation to all concerned of the many factors that lead to overt signs of emotional instability. In the past year it has been observed, particularly in overseas theatres, that while the number of soldiers requiring treatment has steadily decreased, the number of dependants to be seen has, if anything, increased, and this is not altogether due to more families now serving overseas. Measures are now taken to instruct the soldier's wife and children that a period of adjustment to the new environment and climate is required. Military families overseas must be closely knit into family, unit, and station groups if the Regular soldier is to be unaffected by worries about his dependants, and give of his best in his work.

Army psychiatrists have a part to play in the preventive as well as the therapeutic field: in the past decade over one million young men have completed their period of National Service, some of them undoubtedly helped by a short interview at their Army Basic Training Units. Of the 15 per cent of the fortnightly intake so interviewed, over 60 per cent served anywhere in the world and fewer than 2 per cent required discharge on medical grounds, the remainder being suitable for restricted service. That the effort expended in this personnel selection advisory service has been worth while is shown by the fact that the organisation is to continue in the new Regular Army of the future, and personnel selection officers have been unanimous in their requests to retain the advice of the visiting Army psychiatrist.

In the field of psycho-somatic medicine improved antibiotics and hormones,

and modern surgery, have helped greatly in the treatment of diseases as diverse as exfoliative dermatitis and ulcerative colitis, but here again the Platonian decree against separation of the body (soma) and the soul or mind (psyche) applies. No one today would doubt the need for the study of society from the point of view of emotion, anxiety, and the proper use of leisure, and it is not disputed that a great deal of illness is caused by social maladjustment, the secret to the relief of which may lie in the recapture of former values, such as the importance of the home, and of the family as a social therapy group.

The discovery of a wide range of new drugs, which have been grouped, possibly unfortunately, under the generic title of "tranquillisers," bids fair to be the greatest advance in psychiatry since the arrival of such now well-established physical methods of treatment as electro-convulsive therapy for depression, and deep insulin coma treatment for schizophrenia. In the acute schizophrenias most commonly seen in the Army the better-known forms of physical treatment remain the first choice, but cases proving resistant to such therapies, or which cannot be exposed to such methods due to adrenocortical insufficiency, are showing a favourable response to some of the new ataraxics. As the chemotherapy of insanity improves with experience one can look forward to the possibility of more soldiers returning to duty after psychotic episodes. In the neuroses our experience is similar to the concensus of opinion in civil life; the tranquilliser is no panacea for this still indeterminate condition.

The Royal Victoria Hospital, Netley, one hundred years old in May, 1956, is one of the first Service centres to which members of all three fighting Services go for treatment of psychosis. The Royal Air Force have requested that in future all psychotic officers and airmen should be treated at Netley. In the past ten years over 5,000 cases have been treated there, including 1,200 psychotic officers and other ranks; as fewer than 1 per cent of these cases have required transfer to civil mental hospitals on conclusion of treatment, the care and attention of the medical and nursing staff have been repaid by the thought of the large numbers of their patients either returned to duty or to gainful employment in civil life. Officers and other ranks of the Women's Services receive treatment at Holloway Sanatorium, Virginia Water, where there is a full-time Army psychiatrist. This hospital was one of the first to abandon all methods of compulsory detention, as recommended by the recent Royal Commission on the mental health laws, and patients enter and leave without any legal formalities whatsoever.

As the days of compulsory military service draw to a close and the population of the Services changes from adolescents (75 per cent aged between 17 and 21) to adults (the great majority of whom will be married with one or more young children) we must re-orientate ourselves to the need for more military social medicine, with the military family as the unit in the group at home and overseas.

In this sphere we can possibly learn from the new approaches in civil life, where the psychiatrist, in the child guidance clinic and the adult out-patient department, has the services of clinical psychologists, psychiatric social workers, and representatives of other welfare organisations who can help the patient by

effecting changes in the home environment and, at times, in the economic situation. The cost of such additional personnel could be repaid many times by an increase in the number of trained soldiers remaining in the Service instead of leaving to care for their mentally sick dependants. It may well be that child guidance clinics will be established in the major military centres in overseas theatres.

In these days of economies and a reduction by some 66 per cent in the strength of the fighting services one often hears the suggestion that it might be more economic if the care and treatment of mentally sick soldiers and their dependants were handed over to the National Health Service. Overseas, this is obviously impracticable and at home it is considered that the cost is more than justified by the realisation that of all members of the Service, or their dependants, who have the misfortune to fall seriously ill with a disease of the mind, fewer than 1 per cent now fail to return to duty or to useful employment in their home towns. The Army must remain a good employer and look after all its members when they fall sick from any illness, be it of the body or the mind.

OPHTHALMOLOGY SINCE 1948

BY

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late Royal Army Medical Corps

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IN the Golden Jubilee Number of the JOURNAL OF THE ROYAL ARMY MEDICAL CORPS, military ophthalmology was surveyed from the time of Omdurman and though little change has taken place in our organisation since 1948 a considerable output of work has been maintained. A total of some 58,000 patients has been seen annually. The Optical Sections have supplied some 18,000 pairs of respirator spectacles annually in the United Kingdom alone.

The number of Regular ophthalmologists available has been small and the necessity to train officers in the speciality has strained our resources. Few National Service medical officers have been suitable for employment, as most lack pre-Service specialist experience. In 1952 new Standing Orders for opticians were published allowing those qualified to be employed in sight-testing. This is in accord with the organisation in the National Health Service and has been a help to Army ophthalmologists, particularly in dealing with recruit intakes. An important part of the optician's duties is to dispense without delay spectacles for use with respirators so that recruit training is not interrupted.

Since the establishment of the National Health Service, civilian-type spectacles have been available to all ranks at the same rates as those charged to civilians. These spectacles are prescribed by Army ophthalmic clinics and supplied by contract. Spectacles of the respirator type are still an issue and

recently an improved pattern, the Mark IV, has been introduced with larger eye-pieces, curved lenses, and sides better adapted to fit under the respirator than the Mark III, which it replaces.

In matters of more general ophthalmological interest and progress it is difficult to make a selection. There has been a change from individual to team work in the establishment of special clinics to study such problems as glaucoma about which we know so little. The pattern of diseases changes with time, and it is often difficult to decide whether the credit for some improvement is due to new therapy or to improved standards of living. Such conditions as interstitial keratitis, phlyctenular keratoconjunctivitis and hypopyon ulceration are now rare though common twenty years ago, while herpetic conditions of the cornea remain as common as ever. Doubtless the effect of the antibiotics on bacterial and spirochætal infections is partly responsible, the viruses being much less sensitive, though even in this field progress is being made as instanced by the improved prospects in trachoma. As elsewhere in medicine, ophthalmology has benefited greatly by the discovery of the sulphonamides, antibiotics and, more recently, of cortisone which can be administered to the eye locally and which is most valuable in controlling inflammatory conditions, particularly of the anterior segment. Its value in conditions affecting the posterior segment is less certain though systemic administration offers some hope of success.

However, when due allowance has been made for the changes due to pharmacological and social progress there remain those conditions which are mainly surgical and which include cataract, retinal detachment, enucleation, keratoplasty, neoplasms, squint and diplopia.

Though the treatment of senile cataract is not of great importance in the Army there is a small but steady flow of men who, usually as a result of injury, develop monocular cataracts, and though successful treatment is often possible the patient is left with monocular vision unless further steps are taken. Binocular vision can often be restored by the fitting of contact lenses, but the use of intraocular acrylic lenses introduced in 1949, or the more recent Strampelli lens which can be placed in the anterior chamber, open up further possibilities.

Retinal detachment is another misfortune which befalls the soldier, sometimes spontaneously, more often as a result of trauma. While the diathermy operation is successful in many cases, other methods are being tried, such as scleral resection in which a portion of the sclera is excised or pleated, thereby reducing the size of the eye-ball and so shrinking it down on to the retina. This measure may be assisted by the injection of air or vitreous humour, thereby pushing the detached retina back against the wall of the eye. The success of such measures may be less certain than the diathermy operation but they are invoked in the more difficult cases in which success is already less assured.

Herpetic disease of the cornea is prevalent and frequently leaves an anæsthetic, badly scarred cornea which is subject to recurrent attacks of keratitis. This condition is of concern to the Army surgeon as a cause of recurrent sickness and poses a problem of disposal as these patients tolerate tropical sunlight badly. In such cases a lamellar keratoplasty may restore a healthy surface to the cornea,

to be followed later, if necessary, by a full thickness graft with a view to the restoration of vision. Corneal opacities due to other causes are amenable to grafting in suitable cases though this valuable measure is limited by shortage of donor material.

Concomitant squints offer no great problem to the military ophthalmologist at home. His patients are usually adults with one amblyopic eye. Once the question of suitability for service has been settled the only treatment necessary is a cosmetic operation if desired by the individual and this may be fully justified on psychological grounds. Overseas, it is another matter. The care of families entirely devolves on the Army Medical Services and the treatment of squints in young children is highly important to prevent squinting eyes from becoming amblyopic and to maintain or restore binocular vision. In the United Kingdom there is an organised hospital eye service which includes those very valuable medical auxiliaries, the orthoptists, who play an important part in the treatment of squint and indeed are almost indispensable in busy centres. Parents are naturally anxious about their children's squints and may feel that facilities available at home are lacking overseas. Impressed by the "better sight without glasses" school of thought, and of the importance of "exercises," they may form a wrong impression of the role of orthoptics and think that the treatment of squint is impossible without such assistance. Nevertheless the mainstay of the treatment of squint remains surgical, though this is not to deny that the surgeon is relieved of much arduous and time-consuming work when an orthoptist is available. Paralytic squints, often the result of road accidents, are not uncommon either at home or abroad and may give rise to distressing and disabling diplopia. Single binocular vision can often be restored either wholly or in part by careful surgical adjustment of the extra-ocular muscles, and here also the assistance of an orthoptist is invaluable.

Inevitably, through disease or injury, a number of eyes are lost. The problem is then to provide a socket which will accept an artificial eye, which by its movements will appear natural. This is attempted by introducing an implant into the cavity left when the eye-ball is removed and sewing the four rectus muscles to it. Undoubtedly the partially buried implant, with its direct attachment to the artificial eye, gives the more natural movement but the procedure is surgically unsound and few of the earlier implants of this type have survived. Completely buried implants are available which give very fair movement and are probably the only ones suitable for use in the Army.

A number of problems of importance and of interest to ophthalmologists are under investigation, the most important being that of the temporary blindness resulting when the unprotected eye is exposed to the flash of an atomic explosion at night. Retinal burns are liable to occur only in those who gaze at the fireball by day or night, but the intense illumination produced at night inevitably abolishes dark adaptation, probably for quite considerable periods, conducing to confusion and disaster in critical situations.

Plastic goggles are now available which will protect the eyes of those engaged in such dangerous work as mine detection. These goggles will keep out most

high-velocity metallic particles, a very important matter considering how destructive retained intraocular foreign bodies can be.

Research is also being carried out with a view to evolving a goggle suitable for wear in desert and tropical areas, a problem which involves the reconciliation of such opposing factors as ventilation and dust exclusion. The fact that outbreaks of keratoconjunctivitis due to ultra-violet light occurred in drivers in Northern Australia during the war indicates the importance of such researches.

OTOLARYNGOLOGY, 1948-1958

BY

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Royal Army Medical Corps

Adviser in Otolaryngology

INVALIDING from oto-laryngological diseases has shown very little change in the Army over the past ten years and has been confined mainly to those cases of chronic suppurative otitis media and para-nasal sinus disease which have eluded diagnosis at initial selection procedure. The entry standards for both Regular and National Service men have been progressively raised over recent years, thus eliminating the formerly disproportionate amount of inefficiency due to chronic ear disease. The all-Regular Army of the future will demand yet higher standards than have hitherto been possible as there will be no place for men who are of restricted medical category on otological grounds. Examination of all recruits by a specialist on enlistment or before final acceptance is recommended.

Deafness

The increasing velocity of projectiles from modern weapons has resulted in a higher incidence of perceptive deafness due to acoustic trauma following end organ damage of the cochlea. It is anticipated that this problem will increase in future and its prevention is difficult. The issue of rubber or moulded plastic defenders is of doubtful value: they are seldom worn and soon get lost. In sub-tropical and tropical regions, their presence in the external meatus is conducive to otitis externa. Experience to date has shown that the issue of cotton-wool for use as disposable plugs, especially if lubricated, is the most practicable solution.

A further development that has accompanied the increased tempo and stress of modern warfare is the occurrence of psychogenic deafness: the normal temporary deafness experienced in firing may be used by susceptible subjects who project this into a retreat from the hardships of army life. Here lies a considerable field for co-operation between the otolaryngologist and the psychiatrist, the condition being more amenable to treatment in the individual atmosphere of a psychiatric consultation than in the Ear, Nose and Throat Out-patient Department.

Hearing aids of the government-sponsored Medresco type have been issued to military personnel on an individual basis for the past eight years, though mainly confined in the United Kingdom to the senior commissioned and non-commissioned ranks with a limited expectation of further service and employed on base and line of communication duties. Overseas, hearing aids are also provided for military families. Improved smaller and lighter patterns of hearing aid will soon be available.

The education of the deaf child presents a difficult problem in the Services, particularly overseas where no special schools exist. In the United Kingdom, facilities are limited, but each case as it comes to light is placed on the waiting list for admission to a residential school in co-operation with the local county education authorities.

Otitis externa

Probably the greatest remaining problem facing the Army otolaryngologist is the prevalence of otitis externa in those leading a community life, a prevalence which is greatly accentuated in the warm, damp climates of many overseas stations where the disease accounts for a considerable amount of temporary inefficiency. Treatments recommended have been legion, but the adoption in recent years of 1 per cent hydrocortisone ointment has shown promise. An interesting observation in young soldiers is the co-existence of otitis externa and the eruption of the third molar teeth.

Surgical technique

Emphasis in aural surgery is passing to the restoration of hearing damaged by disease after ablation of the diseased area. The fine techniques of tympanoplasty and myringoplasty have great possibilities in Army otology especially for the repair of traumatic lesions of the tympanic membrane.

Recent years have seen the virtual abolition of the formerly common acute mastoid surgery in children and young adults which is reflected in the rarity of intracranial and other complications of chronic suppurative ear disease. Many factors have combined to achieve this: better living standards, improved school medical services, and the advent of chemotherapy and antibiotics.

Radical developments have also taken place over the past decade in the surgical approach to the nose and naso-pharynx, especially in connection with the treatment of malignant disease of these formerly somewhat inaccessible regions. Here surgery and radiotherapy become interdependent: without the recent advances in the application of modern radiotherapeutic measures, these surgical procedures would be less successful. The approach to the naso-pharynx by the trans-palatal route has revolutionised the treatment of such diversified conditions as congenital choanal atresia of the posterior nares and new growths, both benign and malignant, of the naso-pharynx.

Malignant neoplasm of the maxillary antra and of the ethmoidal group of para-nasal air sinuses formerly carried a grave prognosis, but whilst the present figures still leave much to be desired, the combination of tele-radiation and palatal fenestration of the superior maxilla ensures complete clearance of disease

from a cavity which can then be inspected adequately and any recurrence can be dealt with in its earliest stages.

Equipment

The consensus of opinion is that the equipment provided for our Ear, Nose and Throat Departments in peace and war scales is adequate for any recognised procedure. Modern methods of auditory testing by pure-tone audiometry are available at several military hospitals in the United Kingdom and special sound-proof testing booths have been constructed. Overseas, the chief difficulty to be overcome is the adequate servicing of these instruments and this has so far precluded their installation.

ANÆSTHESIA, 1948-1958

BY

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It has been a momentous decade for the speciality of Anæsthetics. The introduction and elaboration of the muscle-relaxant group of drugs has resulted in a revolutionary change in the conception of the basic principles governing the management of general anæsthesia. The development of new anæsthetic agents and techniques and improvements in the design of anæsthetic equipment have made anæsthesia safer, have improved operating conditions, and have enhanced post-operative recovery. Specialised techniques such as controlled hypotension and induced hypothermia have made surgery possible for conditions previously considered inoperable. Techniques for local analgesia have become safer and more effective with the introduction of the new synthetic drug lignocaine, which has now largely replaced procaine in clinical practice. The Army has been by no means slow in conforming with these modern trends.

General anæsthesia

Today deep anæsthesia is found to be neither necessary nor desirable. The use of toxic doses of the more potent anæsthetic agents is now avoided, and instead, by means of the precise administration of selective doses of the appropriate drugs, both by inhalation and by intravenous injection, it has become possible to control accurately the degree of narcosis, analgesia, muscular activity, reflex action and respiratory movement, as may be most suited to the requirement of the operative procedure, with minimal disturbance of the subject's normal physiological processes. This principle has found universal favour and acceptance among anæsthetists, and the improved results obtained are acclaimed by both patient and surgeon. All this is dependent upon the availability of complicated apparatus, a liberal supply of medical gases and a multitude of intravenous agents, all or part of which may be denied to the anæsthetist working under

improvised conditions in a forward area. The Army anæsthetist therefore must also remain adept today in the administration of chloroform and ether by such simple time-honoured methods as the open mask, which in such an emergency can of course still provide the forward surgeon with adequate operating conditions for many of his life-saving and limb-saving procedures.

Local analgesia

In general it is true that in anæsthetic practice in the United Kingdom the advances in modern general anæsthesia during the past ten years have resulted in considerable reduction in the popularity of local analgesia for general surgery. Spinal analgesia, for example, is now exceptional, although by no means obsolete.

Techniques for epidural analgesia and for regional, field or infiltration blocks have been improved and all have their place and their exponents, although their application to military surgery is limited. The inclusion in the Army's list of drugs of lignocaine, in appropriate dilutions and packaging for both topical application and parenteral injection, has made this invaluable agent readily available for the safer and more effective production of local analgesia for oral and general surgery.

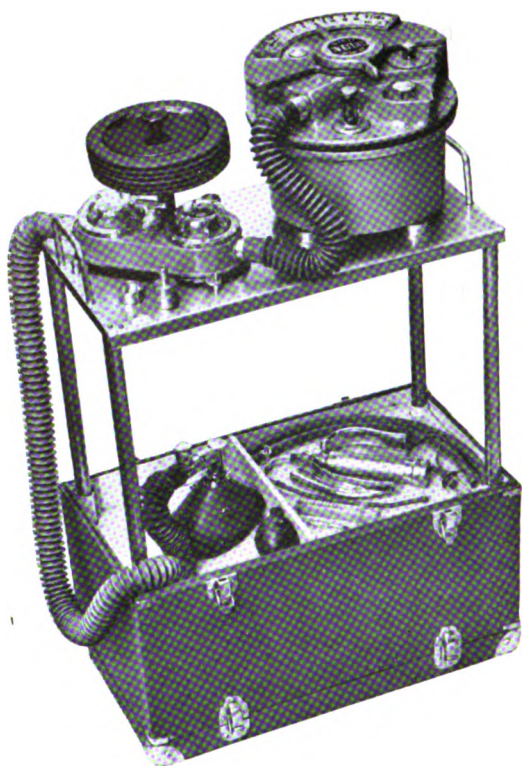
Specialised anæsthetic techniques

The anæsthetist can now play a prominent part in the control of hæmorrhage during surgery, and the intravenous use of ganglion-blocking agents to produce controlled hypotension for this purpose is a practice which has become widely adopted. The overall safety of this technique is still in dispute, but the advantages gained by its employment in extensive plastic surgery of the head and neck and in the surgical treatment of vascular tumours are undeniable.

Cooling for the purpose of analgesia of the extremities, first described by Baron Larrey, Napoleon's Army surgeon, during the retreat from Moscow in 1812, has in recent years been extended into the modern practice of induced generalised hypothermia. This technique, in which the patient's body temperature is reduced to approximately 30° C., enables the cells of the brain, parenchymatous organs and myocardium to withstand relatively long periods of hypoxia and has proved of immense benefit in neuro- and cardio-vascular surgery. Techniques such as these however add appreciably to the hazards of anæsthesia and in the Army their practice is limited to special centres.

Equipment

In the light of modern developments the Army anæsthetist has been equipped with a full range of up-to-date anæsthetic apparatus, instruments and drugs, giving him facilities for the employment of all established anæsthetic procedures. The military hospital central sterile supply department provides him with pre-sterilised syringes and needles, and with sterile packs for local and spinal techniques and for the emergency treatment of cardiac arrest. Each Army hospital has recently been equipped with a positive pressure respiratory pump



The E.M.O. Anaesthetic Outfit, assembled for use on its self-contained emergency stand, comprises a thermo-controlled ether-air inhaler and an inflating bellows unit with uni-directional valves connected in series to a standard expiratory valve mount and facepiece.

PLATE I



The carrying case of the E.M.O. Anaesthetic Outfit designed to give maximum protection and portability.

PLATE II

of the latest pattern and every dental department is supplied with an apparatus of modern design for the administration of nasal nitrous-oxide—oxygen anaesthesia.

Field equipment

The choice of equipment for the Army anaesthetist working under battle conditions presents special problems. The mobilisation medical equipment of a Field Surgical Team for example contains a full-scale modern anaesthetic apparatus designed especially for transportability, but it is obvious that such complex and necessarily delicate equipment may easily become unserviceable under adverse conditions, apart from the unpredictability of the supply of medical gas cylinders in the field (a problem in peace time in some overseas stations). Provision has therefore been made in these scales of equipment for the inclusion of a thermo-controlled ether-air inhaler for general anaesthesia. This apparatus (depicted in Plates I and II) is a modification of the Oxford Vapouriser, which was so widely used in field medical units during World War II, and in its modern form is known as the "Epstein-Macintosh-Oxford Ether Inhaler." An inflating bellows has been incorporated with the inhaler and the whole packs neatly into a light-weight carrying case, which in turn is readily convertible into a portable stand. The virtue of this item of equipment is that it can be used for modern anaesthetic techniques independently of the supply of medical gases. It provides, in fact, a simple but vital reserve apparatus for the Army anaesthetist working under improvised or isolated conditions, as for example in an independent brigade group.

Research

There is ample and varied opportunity for original clinical research in anaesthetics in the Army both at home and overseas. In recent years an ingenious battery-operated respiratory pump was designed and produced from local resources in the Far East, through the skill and initiative of a senior anaesthetist, for the transport of cases of poliomyelitis with respiratory paralysis. In the Middle East a controlled investigation of the value of amiphenazole as a morphine antagonist in the treatment of Army casualties has just been completed. At home a new field service pattern transportable Boyle's anaesthetic apparatus has been developed and is now in the production stage. Very recently a final clinical trial was undertaken at The Queen Alexandra Military Hospital of a manual portable resuscitator designed at the Chemical Defence Experimental Establishment, Porton, for the treatment of nerve-gas and other casualties.

New anaesthetic agents are constantly under review with particular regard to their application to battle casualties. A notable example is the new inhalation anaesthetic, halothane. This potent drug, a stable volatile liquid at normal temperatures, provides a non-irritant, non-inflammable vapour capable of producing rapid induction of anaesthesia and allowing equally rapid recovery, with minimum toxicity to the patient, all obviously attractive features in an agent suitable for military anaesthesia in war time.

New anæsthetic techniques are being investigated. The production of "ataralgia" as described by Hayward-Butt, by the administration in heavy dosage of analgesic (pethidine), tranquilliser (pacatal) and respiratory stimulant (daptazole), which is characterised by complete generalised analgesia with retention of consciousness, is of particular interest in the management of mass casualties. This technique, it is claimed, provides a co-operative, carefree and painfree patient, who can be subjected to surgical operation without further anæsthesia. Such a method clearly deserves the most extensive investigation.

Conclusion

From this brief review of progress in the speciality of Anæsthetics during the past ten years, and of its impact on the Army anæsthetist, it is apparent that the Royal Army Medical Corps is moving with the times and playing its part in applying all the benefits of modern anæsthesia to the military patient.

It can be justly claimed for instance that the excellence of the results of the surgical treatment of casualties in Korea was attributable in no small way to modern anæsthesia.

The training of the Army anæsthetist must enable him to achieve the academic distinction, experience and practical competence of the consultant specialist, but, unlike his civilian colleague, he must also be skilled in the use of simple "rag and bottle" methods of anæsthesia, if he is to be capable of operating under improvised conditions in the field.

The opportunities for specialising in the Army in this branch of medicine are greater than ever before, and it can be confidently asserted that the general standard of anæsthetic equipment provided for the Royal Army Medical Corps compares favourably with that of any other medical service in the world.

RADIOLOGY, 1948-1958

BY

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DURING the past ten years the general trend towards an increased resort to radiological examination has reflected the practice in civil hospitals. Thus in 1950, the total number of radiographic examinations in the Army was 168,000, including almost 70,000 chest cases; by 1954 the total had increased to almost 216,000 with 84,500 chest examinations.

Personnel

The senior radiographers are Regulars of fairly long service whose standards of knowledge and skill have risen sharply and it has now become the rule for senior radiographers to hold the Membership or Fellowship of the Society of Radiographers.

In 1950 the Army X-ray School was transferred from the Royal Army Medical College to the Royal Herbert Hospital. Expansion on a large scale is now proceeding. An advantage of siting the School at the Royal Herbert Hospital is proximity to a large hospital X-ray department. The major work of the School has continued to be the training of junior radiographers of whom an average of seventy have successfully passed the course each year.

To meet modern military requirements the basic course has been increased in length, and the Regulars (who will in time become senior radiographers) are recalled to the School for further instruction, which amplifies the basic courses in preparation for the examinations for radiographer and for the Membership of the Society of Radiographers. Training is also carried out in the X-ray departments of the larger military hospitals. There are also courses for R.E.M.E. and R.A.V.C. personnel. Students at the School have included Gurkhas and soldiers from Jordan and West Africa.

The Society of Radiographers recognises the Corps training of radiographers who are Regular soldiers, provided that their general educational standard is adequate. Radiographers class I are exempted from the first part of the Society's examination and are allowed to proceed direct to the final part.

Apparatus and accessories

The control and surgical treatment of pulmonary tuberculosis has made tomography essential in all main hospitals. The method has thrown light on unusual manifestations of the disease and also on the investigation of other systems of the body. The use of the newer media and of the more powerful and flexible apparatus provided has improved gastroenterological investigations and has increased their value to both physicians and surgeons, while the newer opaque media used in the radiography of the lungs, the urinary system, the bile ducts and the peripheral vessels have further improved investigations. Special mention should be made of the radiographical examination of a series of cases of arterial occlusion of the lower extremity at The Queen Alexandra Military Hospital, as well as of the greater information afforded by phlebography now available.

All major Army X-ray departments have been or are being equipped with high-voltage, high output X-ray units together with motor-driven tilting couches, serial film changers and tomographic attachments. The fastest screens and films are now normal issue.

Radiation hazards

There has been a growing awareness of the risks due to atomic, gamma, "X" and kindred radiations throughout the world and for many years the Army Medical Directorate has realised the risk of exposure to "X" radiation to personnel and patients. Since 1939 all equipment purchased has been subject to strict standards of protection. Protective clothing—*e.g.*, aprons and gloves—have always been of a protective value above that required for maximum kilovoltages used in military hospitals, but improvements in texture have recently been introduced so that now, while keeping the protective value of these items adequate,

the comfort of the wearer is also catered for by really flexible gloves and aprons. In addition to these precautions, departments are surveyed to ascertain radiation levels under working conditions and tests have also been undertaken at frequent intervals using the film badge method both for the department and for personnel. Film badge monitoring of personnel has been undertaken as and when required, but the standard of protection in military X-ray departments has been such that regular monitoring has not been considered essential. However, with the advent of much more powerful apparatus it has recently been decided to carry out for a trial period a regular weekly monitoring service.

Mass miniature radiography

Nine teams have carried out mass miniature radiography in the United Kingdom and examined a total of 1,131,575 individuals over the past ten years.

Their main work has been to examine recruits who have not been examined by the Ministry of Labour and National Service, Regular soldiers undergoing routine review, officers, soldiers and families of all units proceeding and on return from overseas, all ranks released from full-time service, civilians in the employment of the War Department, units under survey for special reasons (*e.g.*, where cases of open tuberculosis have been discovered) and in some cases the personnel of other Services.

In 1957 four teams of the M.M.R. unit took part in a mass survey of the civilian population of Glasgow and 88,553 cases were examined. Until 1957 the work of M.M.R. was carried out with improvised vehicles. In 1958 five Leyland X-ray laboratories were brought into use and they have resulted in smoother and more efficient working. Two mass miniature radiography teams are now working among British personnel in Germany. Two teams are also working in Malaya.

It will be seen from this brief survey that Radiology is playing an increasing role in the work of the Corps.

ARMY MEDICAL DEPARTMENT STATISTICS

BY

S. ROSENBAUM, M.A.

Principal Scientific Officer, The War Office

WITHIN the fairly recent past, a statistical branch sprang from the war-time Directorate of Medical (Statistical) Research, which was absorbed in 1947 into the Directorate of Army Health as A.M.D.5 (Stats). In 1951 it was given a separate establishment, and re-named A.M.D. Stats.

The branch, however, has a much older history than this. When the Royal Sanitary Commission published its famous Report in 1858,¹ a hundred years ago,

¹ Report of the Commissioners appointed to inquire into the Regulations affecting the sanitary conditions of the Army, the organisation of military hospitals, and the treatment of the sick and wounded (1858). H.M.S.O.

it marshalled the existing medical statistics as its most compelling arguments for reform in the medical services of the Army, and recommended as one of the pillars of its proposals that a permanent Medical Statistics Branch should be set up. A sub-committee under the chairmanship of Sidney Herbert (who was also chairman of the Commission itself) worked out the details of how to provide a methodical and exact means for determining the health of the Army. Their Report was published in 1861,² at the same time as the first Statistical, Sanitary and Medical Report for the year 1859.³ These reports, now called Reports on the Health of the Army, have appeared regularly ever since, except for breaks in the two World Wars. The Herbert Committee recommended that the statistics should rest upon periodical returns on the one hand, and medical history sheets for each soldier on the other; in fact the former long held the day until the invention of equipment for dealing with large numbers of coded records.

Now there are punched-card installations and electric calculating machines, and perhaps tomorrow there will be electronic computers and automatic data-processing equipment; but the same basic requirements exist today as did a hundred years ago. Probably a more important development has been the growth of statistics as a mathematical science, giving scope to refined techniques of analysis and the planning of research.

The charter of the branch is to be reproduced in the revised chapter on Medical Statistics in the Manual of Army Health, 1954.⁴ It remarks on the measurement of morbidity as an essential pointer to action in promoting the health of the Army, and an index of its success. Further there are trials and special investigations necessitated by the inability to solve problems by a standard procedure, and these may even require a special survey to be carried out. It is essential to their success and acceptance that sound techniques of design and analysis should be used and, if necessary, developed. Such a consulting role is increasingly being played by A.M.D. Stats, as research into the Army's medical problems increases and as individual medical officers partake in it.

Compared with equivalent civilian groups the Army is in an extremely favourable position for the ascertainment of disease, for controlled observation and treatment, above all for preventive medicine. It has an envied facility for measuring sickness, and a wide scope for its study. A.M.D. Stats intends to play its part in this, to seek, develop and apply statistical methods to research.

² Report of the Committee on the preparation of Army Medical Statistics and on the duties to be performed by the Statistical Branch of the Army (1861). Parliamentary Papers.

³ Statistical, Sanitary and Medical Reports of the Army Medical Department for the year 1859 (1861). H.M.S.O.

⁴ Manual of Army Health, 1954 (1954). W.O. Code No. 10157. H.M.S.O.

THE ROYAL ARMY DENTAL CORPS DURING THE LAST TEN YEARS

BY

Major-General D. J. MUIL, C.B., O.B.E., Q.H.D.S., L.D.S.

Director, Army Dental Service

I WELCOME this opportunity, on behalf of a young and small Corps, to salute the Royal Army Medical Corps on this anniversary and to record how the Royal Army Dental Corps has fared over the last ten years. All ranks of the R.A.D.C. regard it as a great privilege to have been associated so closely with the R.A.M.C. Long may this continue.

What happens in the R.A.D.C. must reflect to some extent what happens in the civil profession, and during the last ten years the events outside have had very real effects on the Corps.

The coming into being of the National Health Dental Service entirely changed the civil dentistry background. To begin with, its introduction in 1948 found far too few dentists on the register to cope with the sudden overwhelming demand for free complete dental treatment and the position was worsened by a shortage, difficult to explain, of entrants to the dental schools. The dentists who undertook National Health treatment were overworked, but their earnings were high, and so it was inevitable that at first there were a number of retirements from the R.A.D.C. to civil life and its settled security. While during the last four years retirements on this account have practically ceased, the civil attractions have deterred National Service officers from taking Regular commissions, and the Army cannot offer sufficient benefits to counter them.

The intake of National Service officers has not been sufficient to fill the gap but nevertheless most of the time the Army has had adequate dental cover comparable with that of the civilian population. It has, however, been a struggle and it is, of course, a disadvantage that so great a proportion of the Corps is newly qualified. While this short article cannot discuss the problem that will arise when National Service ends, it can be said that although the dental schools are now filled, their capacity is very limited and the shortage of dentists is likely to continue for a long time.

There probably have been greater changes in dental procedures over the last ten years than in any like period before. This has meant considerable changes for the Corps in equipment and practice. While the constant change of Corps personnel because of National Service has had many disadvantages, it has had one benefit which we surely welcome ; that this stream of newly qualified men has freshened us continually with the latest teaching from the schools and with their own professional enthusiasm. Coupled with this must be mentioned that in the period under review a number of the schools have re-equipped as also has the civil profession to some extent. Much new and imposing equipment and material have become available. Unfortunately, due to financial stringency, the Army Dental Service has not been able to keep pace with these improvements

and changes. This probably has told against us in the recruiting both of officers and other ranks. Nevertheless, some of the larger new items of equipment are gradually being supplied. The increased awareness of the layman regarding dentistry and its benefits is an encouragement and the Corps cannot but wish that it had the facilities to do more of the great amount of treatment that needs to be done. One direction in which real progress has been made is in the increased number of postgraduate courses which are held for Regular and Short Service officers. For this, financial and outside facilities have happily become available. Further, there has been a widening generally of the contacts with the civil profession with great benefit to the Corps. Important too, is the fact that the Corps is taking part in dental research in co-operation with outside bodies. A great deal has been done to bring the Corps specialists into line with the new standards for consultants in curative dentistry and facilities have been provided to allow trainee specialists to take the Fellowship in Dental Surgery and to do part-time work in selected civil hospitals.

Lack of money and doubts about the size and location of the future Army have made it impossible to effect great improvements in dental accommodation. Much of the war-time accommodation has continued in use and is most unsatisfactory by modern standards. Poor working conditions have done much to militate against the recruiting of dental officers and also of technicians and clerical assistants.

Pleasing has been the success of the dental hygienists (Q.A.R.A.N.C.) trained at the R.A.D.C. Depot and Training Establishment. This ancillary is now being introduced into civil life, and the training methods employed by the Army are in part at least to be used in the civilian training centres, so there are excellent civilian prospects for the women trained in the Army. Unfortunately there are not enough personnel available for our needs. It would be a tremendous help if there were more Q.A.R.A.N.C. to do dental clerical assistant work with the Corps. It is a woman's job. The few that are attached for dental duties have done excellently.

There have been a number of improvements over the last few years in prosthetic procedures, and the dental technician training given in the Corps is still probably the best that can be obtained anywhere. But we have too few of these tradesmen.

Thus despite all the difficulties, many of them not peculiar to the Corps, the last ten years have seen progress in many important directions.

THE FIELD TRAINING CENTRE

BY

Colonel T. M. R. AHERN, O.B.E.

late Royal Army Medical Corps

THE Golden and Diamond Jubilees of the Royal Army Medical Corps are separated by the same ten years that have seen Mytchett develop as the centre of field medical training. The first Director-General's Exercise to be organised by the Field Training School was held at Mytchett in 1949¹; 1958 will see the tenth.

Half a century of the Corps' existence passed by before a special R.A.M.C. instructional centre was created to teach and develop field medical organisation. Between the two World Wars, Territorial Army medical units were the repositories of field medical lore. The younger Regular officer was unexposed to this knowledge. He would never have seen a field medical unit unless he happened to have served in one of the peace-time field ambulances on the North-West Frontier of India, jointly officered by the R.A.M.C. and the Indian Medical Service, or unless he had attended manœuvres or the Field Ambulance Training Camp which had brief spells of glory on Tweseldown racecourse. It is to the credit of those in power in 1948 that we are not today faced with the almost impossible task confronting the 1939 Tweseldown Cadre—that of reviving knowledge gained in former wars and hurriedly adapting it to meet new conditions.

The Field Training School started teaching at Keogh Barracks, Mytchett, in 1949, and depended upon the Army School of Health, whose barracks it shared, for its housekeeping and administration. The situation changed in 1954 when the R.A.M.C. Field Training Centre came into being and took over the administration of Keogh Barracks. The Field Training School then became an instructional Wing of the Field Training Centre. Today the latter controls in addition the H.Q. A.E.R. R.A.M.C., the Army First Aid Training Wing and 37 Field Ambulance, while it administers the Army School of Health and the Army School of Dispensing.

The Field Training School Wing holds courses for National Service medical officers, bi-annual courses for senior officers, courses for non-medical R.A.M.C. officers and Territorial Army P.S.Is. Officers of the Royal Army Dental Corps and Queen Alexandra's Royal Army Nursing Corps also attend for instruction.

In the spring and summer, officers and men of the R.A.M.C./Army Emergency Reserve and Territorial Army are trained, individually or as units, during their fortnight's camp.

The First Aid Training Wing trains officers and men of all arms as unit

¹ Honourable mention must be made of Medical Exercise "Bamboo" organised by the Army School of Health in 1948. This was the first exercise of its kind to be held at Mytchett and served as the prototype for the bigger and better things which followed.—Ed.

first aid instructors, and also runs Casualty Simulation courses. The responsibility for instructing the first batches of R.A.M.C. recruits in support treatment fell to 37 Field Ambulance which arrived at Mytchett early in 1957 as a special experimental unit to try out new organisations and put into practice new ideas on nursing procedures and later evolve the principles of support treatment which has now become an integral part of the basic training of our nursing orderlies. These are the mundane tasks.

Mytchett, however, is better known for the occasions, three each year, when it stages the Director-General's Exercise, the Demonstration for Staff College students (and its rehearsal before a critical medical audience) and the Territorial Army Ambulance Challenge Shield Competition which draw notable and high-ranking people in large numbers and from all parts of the world to the Centre. Fortunately these functions are nicely spaced throughout the year so that the personnel of the Field Training Centre have at all times the prospect and thrill of a not too distant first-night performance.

The Director-General's Exercises, held in early October of each year, take pride of place. There is no doubt that they have had a great influence on the organisation and training of our own medical services and perhaps those of the Commonwealth and our Allies. At least two exercises have had nation-wide reverberations. In 1951 a demonstration—the first to be given in Britain—showed the effects of nuclear weapons on troops in the field. Thanks to this, the then Secretary of State for War was able truthfully to assure the House of Commons that such training had indeed started in the Army. Last year, as a sequel to the 1956 exercise, a demonstration of a casualty filter unit at the Civil Defence Staff College encouraged the national Civil Defence authorities and the Ministry of Health to reorganise the British Civil Defence medical services. Support Treatment training, developed at Mytchett and first demonstrated at the 1956 Director-General's Exercise, has made its impact on the national medical and nursing services, and more recently on the N.A.T.O. and Baghdad Pact medical services.

Each of the nine exercises has had its distinctive name and its special mission. "Britannia" heads the roll, setting the standard by which all the subsequent ones are judged. "Britannia's" successors have blazed many a trail destined for development into a highway of military medicine: "John Bull" (1950) first explored Army and Civil Medical liaison in Civil Defence: "Mushroom" (1951) came as a boon and a blessing to the Secretary of State: a river was successfully crossed in "Rubicon" (1952) and there was no need for a die to be cast: "Cambyes" (1953) served as a timely reminder to those who might be tempted lightly to plan medical support in certain turbulent areas of the world: "Avernus" (1954) tilted at tradition, notably the one which held the road to the Styx to be one-way only. That road is now open to two-way traffic, and a veil was lifted to disclose challenging prototypes of new units: "Royal Road" (1955) cried "Faugh-a-Ballagh" and the way to a new field medical organisation was opened: the principles of support treatment were introduced by "Deucalion" (1956) and the filter unit used at Cassino was revived: "Automedon" (1957)

galloped over the Brigade Group, plunged to mother earth, and there discovered a pearl of great price, the new Field Medical Company. All have been serious of purpose and all have, in the Mytchett tradition, been light-hearted enough to poke fun at themselves and at any other person or institution deemed to deserve it.

The Staff College Demonstrations take place in February and often in a snowstorm. The staff and students from Camberley are shown demonstrations of divisional and corps medical organisations. The demonstration aims at realism which today necessitates co-operation of other arms and services. In recent years, Royal Tank Regiment squadrons, battalions of Guards and the Parachute Regiment have made valuable contributions: the Royal Engineers with their bulldozers and bangs, and the Royal Corps of Signals, have provided us with the necessities of war. At all times we have leant heavily on the Royal Army Service Corps, the Royal Army Ordnance Corps and the Royal Corps of Military Police.

The competition for the Challenge Shield of the Territorial Army was first staged at Mytchett in 1952. This is a pleasant occasion. Teams from Territorial Army medical units go through a stiff series of first aid and field-craft tests, and on this annual Saturday our T.A. friends very aptly paraphrase the citizen of Glasgow into "Mytchett belongs to me" !

The association between Mytchett and the Reserve Army is a very close one. It is the Headquarters of the R.A.M.C. Army Emergency Reserve, as is clearly but clandestinely shown in the R.A.M.C./A.E.R. arm flash, for the stretch of water shown heraldically in the design is identifiable to the initiated as Mytchett Lake. Their medical units train at Mytchett each year, and it is a recurring pleasure to welcome R.A.M.C./A.E.R. officers and men to their military home. Ties with the Territorial Army are less official but none the less are close and valued. Apart from the annual "T.A. Shield" competition, each training season brings a number of Territorial Army medical units to camp, to make use of the special training facilities of the Field Training School Wing. This year the A.D.M.S. and all three field ambulances of 43 (Wessex) Infantry Division (T.A.) are to train at Mytchett, as also will a number of other units.

These training periods provide one of the most productive meeting grounds, and perhaps the happiest, between the Regular and the Reserve R.A.M.C. : may the next ten years see this tie become even stronger.

The years between 1949 and 1958 have seen the Field Training Centre evolve from the original Field Training School. The most remarkable feature of these ten years has been not the growth in size but the growth in influence: it is now much more than a training establishment. The Field Training Centre has become an instrument through which the Director-General, Army Medical Services can demonstrate his policies to the General Staff, to the other Fighting Services, and to interested governmental ministries such as the Home Office and the Ministry of Health. The success of the Centre in this important role is well demonstrated by the lead it has given to current thought on methods of providing and organising medical cover and by the very considerable interest

of the civilian authorities in its ideas and projects. The Field Training Centre has every reason to face the future with confidence and hope that it will continue to fulfil its vital role with growing strength. It must remain the necessary link between the Regular and the Reservist ; it must continue to play its part in the evolution and design of future field medical units and to disseminate information. The chief problem of future years will be to find new ways and means of meeting greater tasks with smaller resources and in this, too, it must not fail.

THE NEW TRAINING

BY

Lieut.-Colonel D. H. D. BURBRIDGE, O.B.E., M.R.C.S., L.R.C.P., D.P.H.
Royal Army Medical Corps

The French practise it ; the English talk about it ;
the Americans cause inquiries to be made into it !

THE above statement may be true in another sphere of activity, but is not applicable in the field of mass casualty management. For it was publicly acknowledged at the S.H.A.P.E. Medical Conference in 1958 that the British Army medical services have given the medical services of the N.A.T.O. nations a *practical* lead. Demonstrations of our method for providing support treatment to seriously injured patients have met with unqualified praise from both civil and military authorities. What are the principles upon which it is based?

Once it is accepted that the enormous numbers of casualties occurring suddenly at one point in time will overwhelm the capacity of the specialist services available, it is clear that the period between wounding and surgical intervention may have to be increased beyond the accepted optimum perhaps by a factor of 24 or more—*i.e.*, eight hours will become eight days. During this time the patient must be sustained and, if possible, made fitter for operation.

At the same time the qualified *nursing* cover available to sustain these patients will also be proportionately swamped. Thus skilled nursing procedures must be delegated to the lower grades of nursing orderly and even to other tradesmen in the medical services.

It is therefore a question of determining what these delegated skills are to be, and how they are to be taught. Fortunately, as soon as definitive treatment is withheld, many of the delicate decisions relating to differential diagnosis and to individual patients' needs also go. There are five broad groups of patient—injuries to limb, head, chest or abdomen, and burns. When one resists the temptation to overtreat these categories, it becomes evident that their requirements fall under two main heads.

The first is their "physiological care"—food, water, shelter, warmth, cleanliness, comfort and removal of excreta. If to these are added the recording of basic data—temperature, pulse, respiration and blood pressure—one has covered the procedures that are the common need of all patients.

The second covers the special requirements of different cases. Luckily again, there is a limit to what can profitably be done and some procedures meet the demands of quite unrelated lesions. Thus these requirements are few in number.

By a detailed analysis of the essential tasks, what have become known as the *Twenty-Four Procedures* have been evolved. The author had the privilege of examining the world-wide reports on attempts to introduce the training of medical personnel in these procedures. The most important and obvious fact was the marked variation in their local interpretation and the need for standardisation of teaching methods, particularly when the skills were practised at team level on specific types of case. Until such uniformity is achieved, anyone attempting to produce *ad hoc* units to undertake sustaining treatment at short notice will work under unnecessary difficulties. The inevitable smallness of staff compared with work-load must preclude anything but the smoothest flow of activity.

The fact is that "sustainers" have to take on more work than orderlies do in a routine hospital ward and cannot, as a group, be less skilled. The originators of the idea supposed that the skills would be taught by rote and not reason but could scarcely have anticipated the startling development, widely experienced, that procedure training has awakened *an active interest in nursing care and a confidence not achieved by conventional teaching methods*. For these drills are taught empirically, building up as time goes by sufficient background to satisfy the enquiring mind or to make the drill "stick." Thus we do not have to say with Cassius (*Julius Cæsar*, Act IV, scene iii)

... all his faults observed ;
Set in a notebook, learn'd, and conn'd by rote,
To cast into my teeth.

In point of fact, all soldiers of whatever intellectual level, can master the skills grouped above under "physiological care" and are most likely to do so if taught empirically. At least one third of all soldiers can master the special skills and this is a high enough proportion to meet the case. When men show an aptitude for a particular procedure they can be posted into a ward section where they are likely to be most useful (see below).

Following the successful demonstration of these procedures at the Director-General's Annual Exercise (1957) "Medical Automedon," it was decided to introduce them into the recruits' training syllabus. The first step was to attach "intakes" of recruits, immediately following their ten weeks' basic training, to 37 Field Ambulance for a further two weeks' intensive course on the procedures before joining their units. From mid-December, 1957 to mid-February, 1958, 579 recruits passed through in this way and the training went well. Thereafter this additional training was undertaken at the R.A.M.C. Depot and will continue there until it is integrated this year (1958) with the syllabus for nursing orderly, class III, to become a sixteen weeks' basic training course for all recruits. In this way standardisation will be achieved at the level of the individual, and collective training in units will be made immeasurably easier.

The second principle upon which our method is based is that all medical

units should be designed to provide at short notice standard "field medical companies." These must be trained and equipped to receive and sustain, without any outside help, one hundred seriously injured casualties following a disaster of any kind, for a period of up to eight days.

This sub-unit has been evolved experimentally and has shown its mobility, flexibility and speed of action from both mechanical transport and Beverley aircraft.

Its basic establishment is now well known and amounts to three medical officers, three nursing officers, three sergeants (state registered nurses or nursing orderlies, class I) together with twenty-seven nursing rank and file, and a small administrative element. It is divided into three 33-bedded ward sections, over which the clinical staff can be equally spread. Thus nine nursing rank and file care for thirty-three patients, day in and day out, for eight days; the simplest formula is three men to eleven patients and all team work can be based on this assumption.

For training and planning purposes it has been assumed that the one hundred patients to be sustained are dominantly injured in the following way :

- (a) 33 limb injuries (large muscle wounds, compound fractures, crush injuries)
- (b) 33 head, chest and abdominal injuries in equal numbers
- (c) 34 severely burnt (20-50 per cent body surface).

This arbitrary breakdown neatly fits the ward structure and has a reasonable statistical basis although it disregards the question of multiple injuries. (These can be assessed but are best avoided at this stage.) The figures are useful in allocating training commitments to ward sections and individual medical officers, in assessing required expendable and non-expendable medical equipment, patients' rations and day by day work load in the different wards. It is assumed that patients are segregated by group injury to diminish the number of skills to be practised in any one ward as a routine.

Based on this abstraction it is also possible to evolve a continuum of activity suitable for each ward which, once the patients have been bedded down, will be observed by the nursing staff unless given specific orders by the medical officer, sister or sergeant, who in the meantime are free to give detailed attention to the obviously worst patients.

It is now possible to give target figures for the setting up of such a unit in the field. The experimental unit can set up from tactically loaded lorries and admit one hundred patients in one and a half hours. It takes an extra half-hour if all equipment is to be manhandled from aircraft.

It is difficult to see how the training could be further streamlined to meet this new situation. What can be improved is the equipment available for the job. The two hours preceding the first rush of medical responsibility will be arduous and exhausting and may detract from the steadiness and high standard of the staff, however devoted they may be. Much of this work-load could be reduced by providing lightweight tentage, lightweight beds and less bulky medical and ordnance equipment. These matters are now under active consideration. One

satisfactory outcome of the trial period has been the evolution of simple, standard trays required for most procedures.

It is not possible to forecast how well the scheme would work should the time come. The fact remains that many experienced medical administrators and clinicians in the N.A.T.O. countries are convinced that this first tangible solution is also a splendid one and that the other countries can learn from us.

Walt Whitman has the last word :

I do not know what is untried and afterward,
But I know it will in its turn prove sufficient, and cannot fail.

THE TEACHING OF SUPPORT TREATMENT OF MASS CASUALTIES TO R.A.M.C. RECRUITS

BY

Captain M. J. P. WEBSTER

Queen Alexandra's Royal Army Nursing Corps

ONE of the most exciting and stimulating ventures in training began in 1957, when, in December of that year, the teaching of the support treatment of mass casualties to R.A.M.C. recruits was introduced. This was the climax of some ten months' intensive investigation and research into the basic procedures to be taught and of work studies on the methods of training, all of which were carried out by a team from 37 Field Ambulance led by Lieut.-Colonel D. H. D. Burbridge at the Field Training Centre, Mytchett.

As a result of these investigations it was decided that the *Twenty-Four Procedures* of support treatment could be taught on a course of fourteen days' duration, and since December each R.A.M.C. nursing orderly recruit has, on completion of basic training, attended a course on this subject. In the first instance training was carried out at the Field Training Centre, Mytchett, but in March, 1958, it was undertaken by the Depot and Training Establishment R.A.M.C. where it continues.

The teaching staff consists of three medical officers and three state registered nurses (one nursing officer and two sergeants, R.A.M.C.). The numbers on each course vary from ninety to one hundred and sixty men, who are divided into separate groups of thirty—the number best suited to good instruction and the dictates of space and equipment. The programme is arranged so that, as far as possible, a lecture by a medical officer is followed by a practical nursing class on the same subject, and during practical instruction the trainees work in pairs. When conducting intensive practical training of this nature the most detailed consideration must be given to the advance preparation and layout of equipment and all practical procedures must be standardised and whenever possible illustrated by diagrams. It was to these three factors—preparation, layout and standardisation—that most of the work study carried out by the sister tutor was directed.

It is essential that the practical nature of this training and the background in which the work will be carried out are made clear to the student before training commences and from this point of view the introductory talk must be presented vividly. If the imagination is captured in this early phase the task is made easier for both tutor and trainee, and if a field demonstration can be arranged during the second week of training the sense of realism is maintained to advantage.

It is also important to arrange training so that each recruit assists a medical officer in certain techniques such as the putting up of an intravenous drip. By this means the recruit learns to anticipate the medical officer's wishes in such things as positioning the patient.

In teaching the procedures of support treatment reference to general nursing care is automatic and, in fact, when the syllabus is analysed the only items of the nursing orderly, class III syllabus which are not included are the preparation and serving of meals, the giving of steam inhalations and of hot and cold local applications. The course can therefore be an excellent method of preparation for or revision of nursing orderly, class III training.

The response so far has been most encouraging not only by virtue of the enthusiasm of the recruits but also by the way in which the average man acquires practical skill in carrying out even the more advanced procedures after one demonstration. This initial success has already fostered a further development as the recruit course at the Depot and Training Establishment will shortly be extended from ten to sixteen weeks, during which the present courses of basic training, nursing orderly, class III and support treatment will be integrated. This should make the task of instruction easier as the student will have a greater knowledge before approaching the practical procedures which, in turn, will be carried out at the most appropriate places within the whole syllabus. Training in support treatment does not end after the initial course; there must be constant revision of and practice in the procedures after leaving the Depot if proficiency is to be maintained.

R.A.M.C. APPRENTICES SCHOOL

BY

Colonel W. A. ROBINSON, O.B.E., M.D.

late Royal Army Medical Corps

READERS of this JOURNAL are accustomed to look upon its pages as a source of information on military medical and allied subjects, coupled with reports on field exercises of the past, present and future trends. Never has the writer seen in its pages anything on one of the most important developments in the Corps, namely "The R.A.M.C. Apprentices School." It is therefore considered to be a suitable topic for publication in this the Diamond Jubilee number.

History

The R.A.M.C. Apprentices School was opened at the Depot in September, 1955, and placed under the command of the Commandant, The Depot and Training Establishment, as an integral part of the Corps, and is designed to train up to eighty boys. Much thought was given to the selection of its staff and the provision of suitable accommodation. It is now one of the most interesting and progressive schools of the Army.

Aim

The aim is to train boys to become the future senior N.C.Os., warrant officers, and non-medical officers of the Corps. The basis of training is the development of character, leadership, and educational attainment to enable these boys to be useful members of the R.A.M.C. and to follow a trade.

Conditions of entry

Boys are selected between the ages of 15 and 16½ years of age from British subjects all over the world whether or not they have any military connections. They must be of good character, medically fit, and must pass the Army Apprentices Examination. Final selection is based on a headmaster's report and the gradings given by a personnel selection officer.

Environment

The school is situated in the country within the Depot R.A.M.C. and is run on much the same lines as any good grammar school. Boys are allocated to Houses named after distinguished members of the Corps, for example Martin-Leake, Chavasse and Harden houses.

The boys are housed in hatted accommodation which is centrally heated, and is bright in colour. They have a lounge or common room, restaurant, library, games room and television room. Adjacent to this building are classrooms, model ward, laboratory and hobbies room, all of which are well equipped and furnished.

Curriculum

The aim is to enable a boy to obtain his Army First Class Certificate of Education or the General Certificate of Education, qualify as a nursing orderly, class III, and pass the Corporals Course for promotion. This is achieved by a well thought out syllabus and a boy can obtain these qualifications in about two years. In the syllabus for nursing orderly, class III, boys are trained in support treatment. By the time these boys leave they can be considered as suitable material for selection for training as laboratory technicians, hygiene assistants, index student nurses, radiographers, clerks, physiotherapists, storemen (technical) and operating theatre technicians. Their future progress is largely dependent on the interest taken by the medical units to which they are posted on leaving the school. Since its foundation 60 boys have taken up trades as follows :

Hygiene assistant 16, student nurse 15, clerk 15, physiotherapist 5, laboratory technician 4, storeman (technical) 1, radiographer 2 and operating theatre technician 2. It is interesting to note that eighteen of these boys had passed in addition to Class I Education from one up to eight subjects at G.C.E. level.

Sporting activities

All boys are encouraged to play games and to lead an active life. This year competing with other Apprentices Schools larger in numbers they have won the cup for the Minor Units section of the Army Boys' Cross-country Championships and the Army Boys' Rugby Championship. Since its formation they have also won the R.A.M.C. Depot Inter-Company Small Bore Shoot and were runners-up in the Young Soldiers' Shoot of the Army Small Bore Championship.

Outward Bound training

Each week-end sees half of the school engaged in some form of Outward Bound training such as rock climbing, cliff rescue, canoeing, hiking, camping, map reading and initiative exercises designed to develop self-reliance and powers of leadership. The Duke of Edinburgh Award has recently been introduced into the school.

Hobbies

These are an essential and integral part of the boys' training. Excellent facilities are provided for carpentry, model making, photography, art, amateur dramatics and musical appreciation.

Speech day

This is held during Corps Week and is equivalent to "Speech Day" at a civilian school. It is held in the evening and the next day is a day open to all parents to meet the staff, discuss their sons' futures and visit the school. This year Speech Day was Saturday, 28th June, and on Sunday, 29th June, the school was open to the general public.

Conclusion

Although the school is essentially a military school, its aim is that of a first-class civilian boarding school where educational attainment, development of character, and leadership are given priority. We look upon these boys as the future backbone of the Corps and those of us who have seen them at work and play have no doubt in our minds that they will take their places as non-medical officers of the Corps via its senior N.C.O. and warrant officer ladder. Selection is based on quality rather than quantity, and because of the insistence on a good standard of entry the tone of the school is high.

THE R.A.M.C. OTHER RANK

BY

Major P. MURTAGH, M.B.E.

Royal Army Medical Corps

OUR Diamond Jubilee, like all other family occasions which mark the passing of the years, is a time for taking stock, for contemplating the past, assessing the present and predicting the future. As far as this JOURNAL is concerned much of this stock-taking is related to changes and advances in techniques and treatment and we tend perhaps to forget the men and women who apply these techniques and carry out these treatments—the other ranks. It is therefore fitting to consider the advances in the selection, training and status of the other rank, which have been happening in recent years.

Formerly the initial introduction to nursing duties was an all-male affair, and subsequent training was frequently regarded as just something which had to be done. As there was little attempt to relate the syllabuses with those of official outside organisations, much talent was wasted or was not given the chance to develop fully. While this old system of training met the requirements of peace it was inadequate for war which saw the disappearance of centralised training and the introduction of many modifications to suit the needs of particular theatres or even particular campaigns. Thus with the return of peace, we had a system of training designed primarily for conditions of active service and which, due to demobilisation and other military needs, had to be continued for some years. It was during the first years of the present decade that a return to a centralised system of training occurred, a system which recognised that all other ranks, in addition to their specialist duties, should be capable of undertaking the care of sick or wounded soldiers and that basically, therefore, all must be nursing orderlies.

With this aim in view, a committee was established to co-ordinate our syllabuses with their civilian counterparts and to ensure if possible that the R.A.M.C. other rank could obtain a worth-while civilian qualification as a result of his Service training. Progress has been steady and the list which follows speaks of a solid achievement in realising the recommendations of that committee.

State Registered Nurses.—Our hospitals are now recognised for training purposes and a system of indexed student nurses has been adopted. Fifty-three have obtained the qualification of S.R.N. since 1948.

State Registered Mental Nurses. The same conditions apply as for state registered nurses and eleven have qualified since 1948.

Physiotherapist. Our school is now recognised by the Chartered Society of Physiotherapy, and students may qualify as members. Two have qualified since 1948, and more are now under training.

Radiographers. These technicians may obtain the Diploma of Membership of the Society of Radiographers (Radiography). Twenty-six radiographers have qualified M.S.R.(R) since 1948. In addition one has obtained the Fellowship of the Society.

Laboratory Technicians. These may now obtain the Membership, Associateship and the Fellowship of the Institute of Medical Laboratory Technology. Nine have obtained the Associateship and ten the Fellowship since 1953.

Hygiene Assistants. A limited number of specially selected hygiene assistants are trained for the qualification of Public Health Inspectors' Certificate. Two have qualified.

Operating Theatre Technicians. These may obtain the Diploma of the Association of Operating Theatre Technicians. Five have qualified since 1948.

Dispensers. These may obtain the Assistantship of the Society of Apothecaries, and six have qualified since 1948.

Special Treatment Orderlies. These orderlies may become Members or Associates of the Institute of Technicians in Venereology. This is the most recent "recognition."

It must be remembered that these achievements have been brought about against a background of National Service when the Corps has consisted largely of a floating population of National Service men and conditions for training have been denied the stability of an all-Regular Service.

To ensure that our future training is kept abreast of modern requirements it is the intention to set up a permanent working party, charged with the task of keeping our training needs constantly under review. It may be said with confidence that our present training facilities are better than they have ever been and if we build on the sure foundations which now exist the future not only of the individual other rank but of the Corps itself is assured.

RECENT ADVANCES IN THE TRANSPORT OF CASUALTIES

BY

R. I. BODMAN, M.B., F.F.A.R.C.S.

Major, Royal Army Medical Corps, Army Emergency Reserve

THE medical services have been quick to exploit the latest developments in air transport for casualty evacuation. The almost daily arrival by air in the United Kingdom of ill and injured soldiers from overseas stations is ample evidence that flying has become a conventional mode of evacuation. However, it is as well to remember that although aircraft can carry patients great distances, quickly and in great comfort, there still remains a journey over the ground at each end of the air lift. This is now carried out by stretcher-jeeps and ambulance cars and may, under active service conditions, be slow, uncomfortable and possibly dangerous to the patient. The development of the helicopter, which needs no elaborate runway for take-off and landing, has offered the possibility of extending the advantages of air evacuation up to the front line.

The helicopter was first used extensively in Korea, where the aim was that every case in the forward area should now be evacuated by this means. Due, however, to their limited numbers their use had to be restricted to specific types

of cases, including those with fractures of a severe nature or with penetrating wounds of the abdomen, head or chest, and those who were too ill to stand conventional methods of evacuation. For the same reason another stipulation was that helicopters should only be used where conventional means failed and that they would not be asked to land unless the area was free from small-arms or mortar fire.

In practice the regimental medical officer would ask his headquarters to call up Brigade headquarters, who in turn contacted Division. There the message was passed to Medical, who relayed it to Corps, and Corps in turn directed a helicopter from their controlled pool to the unit.

It was essential that the helicopter pilot should know the location and map reference of the landing ground, how it was marked, the number and types of casualties, and any special information; for example, local wind, obstacles, etc. As a routine all forward medical officers were provided with means for indicating their position.

Difficulties arose because many cases were evacuated direct to hospitals without passing through a forward medical unit and therefore were not included in returns, and there was a steady loss of blankets and stretchers which were not replaced. The use of helicopters has since been developed in Malaya and culminated in the mass evacuation of allied wounded at the Port Said landing of November, 1956.

The outstanding advantage of evacuation by helicopter is speed, which may be critical for a shocked patient. The dangers of moving patients with abdominal and chest wounds by road have been so great that it has been necessary to recommend that such patients be held in forward units rather than move them. This does not apply to evacuation by helicopter as the vast majority of casualties can be taken quickly and with a minimum of disturbance to a fully equipped resuscitation ward and operating theatre. In this respect the advantages over evacuation by stretcher-jeep are enormous. The smooth vertical take-off and landing is also an improvement on the light plane's performance. The helicopter can also be used for removal to ships; an aircraft carrier can accommodate the largest helicopters and a landing deck for smaller helicopters can be built on practically any ship; the French at Port Said fitted their hospital ship *Marseillaise* with such a deck, to take their "Bell" helicopters.

Over great distances helicopters will not replace conventional aircraft, for the latter are much faster and more economical. Today night-flying presents a special problem to helicopters, as the instruments at present available may mislead the pilot as to his position in space; but there is every expectation that with the improvement of their instruments night-flying will soon be mastered.

The vulnerability, as for fixed-wing planes, depends on the size and speed of the target. So a smaller helicopter like the "Sycamore" is about as vulnerable as an "Auster," but a "Whirlwind" presents a larger target. Helicopters usually fly low and rather slowly, so are vulnerable to small-arms fire; on the other hand, in such circumstances they fly within defended areas. Their vulnerability to fighters is somewhat offset by their capacity to take evasive action; provided the



MODERN METHODS OF CASUALTY EVACUATION

Face page 180

pilot sees the fighter first he has a very reasonable chance of escaping. A helicopter can drop vertically at the rate of 2,000 feet per minute, so a fighter coming in at a high speed must be prepared to dive steeply at a low altitude if he is to press home his attack.

At Port Said the Joint Experimental Helicopter Unit and the Royal Navy provided "Sycamores" and "Whirlwinds" to land Royal Marine Commandos from the aircraft carriers nine miles off-shore. Over 400 officers and men were landed as soon as the assault force landing on the beaches had control of a suitable landing zone near the de Lesseps statue. The first casualty collecting post of 15 Field Ambulance had also landed from assault craft and made its way to the landing zone; by the time the third wave of helicopters arrived casualties were ready for loading for the return flight. Over one hundred casualties were evacuated in this way. The organisation for dealing with evacuation was very simple. A casualty collecting post was set up in the nearest large building, 300 yards inland; with the short journey to the ships and the number of helicopters available it was possible to dispatch casualties from the casualty collecting post as soon as they had received first aid treatment. A naval sick berth attendant supervised the loading; depending on the type of helicopter, either two or four stretcher cases and a "walking wounded" were carried. Some casualties were evacuated directly from regimental aid posts in the earlier stages of the assault; one marine was wounded and returned to the sick bay only nineteen minutes after leaving the carrier. If there had been no helicopter evacuation, many of the seriously wounded would have had to have undergone major operations and subsequently be nursed in a partially demolished building still under fire from snipers.

The one disadvantage of helicopters at the moment is that they are expensive to buy and maintain; this is partly offset by their speed and quick turnaround. A single "Whirlwind" can evacuate as many casualties as fifteen or twenty stretcher-jeeps over the same distance, in the same time. There is every hope that when these aircraft become more readily available their use will be extended in both the civilian and military fields.

A new ultra light helicopter is shown in the plate.

HOSPITAL PLANNING

ADVANCES DURING THE LAST 10 YEARS (1948-1958)

BY

Major D. S. PATON, M.B., Ch.B.

Royal Army Medical Corps

THE aim of this paper is to outline recent developments in the evolution of the ward unit in military hospitals and to show what general trends are occurring and how they are being applied for the benefit of our patients. No attempt is made to cover points of detailed planning, nor to review the purely architectural aspects of the subject.

GENERAL WARD DEVELOPMENTS

The typical ward today in the majority of military hospitals is the Nightingale ward (Fig. 1). In the nineteenth century this layout was admirable, when it was good nursing rather than good doctoring that saved lives in hospitals. It combined ease of supervision and other nursing requirements with simple basic hygienic considerations—*i.e.*, good cross-ventilation and optimum bed spacing—(1,500 cu. ft. per patient and 100 sq. ft. per bed). The ward ancillaries were few in number and situated at either end of the long narrow ward, giving the impression that they were applied perhaps as an afterthought rather than as a necessity. Such wards today are reminiscent of the institutional atmosphere of a bygone era.

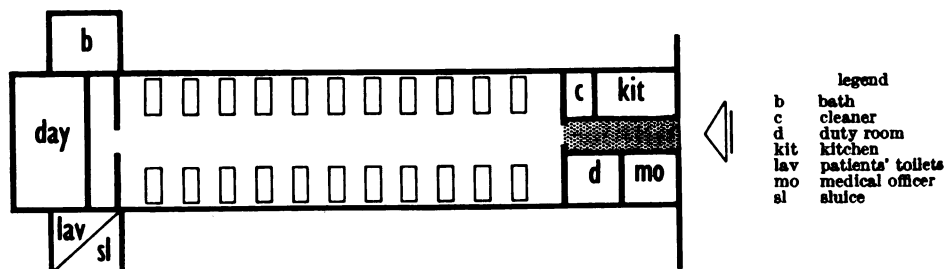


Fig. 1. Nightingale Ward

Privacy. In the present century, and particularly in the post-World War II period, a higher standard of living has led to a demand for greater privacy for patients in hospital. Modern practice now favours the Rigs layout of beds—*i.e.*, beds placed parallel to the long axis of the ward. This not only may afford the patient a more pleasant view of the outside world but psychologically keeps him in touch with it as well. Moreover, it also ensures better natural lighting of the patient, which pleases the doctor. In the ward itself, the beds are usually grouped in small units separated by partitions, each containing four or six beds, and in addition there should be a useful proportion of single and two-bedded rooms. By this arrangement greater privacy can be obtained for the patient, compared with that afforded by the Nightingale ward layout, and maximum flexibility is achieved to meet both nursing and social requirements. The use of bed curtains to screen off each bed greatly adds to the patient's sense of security, and minimises the risk of unnecessary embarrassment, not only to a particular patient but also to others in near-by beds. In the ablution area, screens between individual wash-hand basins will provide additional privacy for patients.

Working conditions of staff. There is no doubt that inadequate ward ancillaries and facilities produce a demoralising effect on ward staff. The Nuffield Provincial Hospitals Trust jointly with the University of Bristol have undertaken time and motion studies in an endeavour to establish an ideal ward layout to meet present-day requirements. Their findings,¹ which are reflected in the

¹ Nuffield Provincial Hospitals Trust (1955). *Studies in the Functions and Designs of Hospitals*, Ch. 1. 1st ed. London: Oxford University Press.

majority of hospitals, both civil and military, now in the course of planning or construction, have led, *inter alia*, to the concept of centralised ancillaries in an endeavour to eradicate unnecessary journeys by the ward staff. Furthermore, the proper function of each of the ancillary rooms which, with the ward itself, constitute the ward unit has been defined and considerable thought has been given to the fittings and fixtures that should be included to enable the nurses and orderlies to perform their respective duties in the most efficient and economical manner. The provision of a treatment room in each ward, to which a patient can either walk or be wheeled on his bed, has already become well established in military hospitals. The advantages are twofold: firstly the risk of cross-infection is reduced, as dressings, etc., are done not in the open ward but in a specially designed room preferably with mechanical extraction ventilation; secondly, not only the patient but also the medical and nursing attendants benefit from greater privacy and from having every facility close at hand.

In an attempt to reduce cross-infection to a minimum, it has been recommended by the Nuffield Provincial Hospitals Trust that a separate clean utility and a dirty utility room be incorporated *en suite* with the treatment room. The function of the clean utility (preparation) room is to provide a place where the nursing staff can prepare trolleys, etc., for various nursing procedures, thus freeing the treatment room for treatment only. Dirty utility room is just another name for a sluice, which of course is for the disposal of contaminated materials, the washing of dirty instruments, etc., and the washing/sterilising of bed pans, etc. The other components that are grouped under the term "ward ancillaries" have already been described in a previous number of this JOURNAL.²

Atmosphere. The intelligent use of colour plays a big part in the production of a cheerful ward atmosphere. The general aim in wards is not only to present restful wall surfaces to the patient whilst in bed, but also if possible, to provide a more stimulating series of vistas to the ambulant patient. This is particularly relevant in day spaces where patterned wallpaper of a tone and colour contrasting with the general surfaces may be used to advantage, and especially on the wall which contains the focal point of the room—*i.e.*, usually the one where the fire-place is situated. Small patches of bright colour within the direct vision of the patient should be avoided as these are likely to prove disturbing. However, the end walls of wards, if painted in a clear strong colour such as red, citrus yellow or green, often harmonise well and the resulting effect goes far in creating a cheerful and domestic atmosphere. A particularly good example of the use of contemporary colour can be seen at The Queen Alexandra Military Hospital, Millbank, which has been redecorated recently under the personal direction of the War Office architects. It is intended in the near future to introduce soft furnishings of contemporary design which it is anticipated will produce an even more domestic atmosphere in the wards.

Early ambulation. Advances in surgery call for early post-operative movement, so that fewer patients are tied to their beds for long periods. A day space, comfortably furnished and with a good outlook, is therefore essential so that

² MACKENZIE, S. (1952). *J. roy. Army med. Cps*, 98, 110.

up-patients can sit and relax away from the bedside. A portion of the day space can be used as a dining bay and should therefore have easy access to the ward servery. Decentralised lavatories which are wide enough (4 ft. 6 in.) to take a self-propelling sanitary chair and which are fitted with a small wash-hand basin are a prerequisite of early ambulation when the majority of patients can either walk or propel themselves to the toilet.

Ward noise. There is no doubt that ward noise emanates from two principal sources, viz. ward traffic and ward ancillaries—i.e., ward serveries and sluices. This is a problem which has received insufficient attention in the past, but latterly there has been an increasing awareness of the importance of reducing noise at source. Where this is not possible noise can be damped down by the introduction of sound-absorbing materials, and by so positioning those parts of the ward unit which are the noisiest farthest from the majority of patients.

NEW CONSTRUCTION

No major new construction for the Army Medical Services has taken place in the United Kingdom during the period under review, but several projects have been built or planned in stations overseas, and it is felt that certain features might be of general interest.

When wards are designed, in addition to the foregoing points the influence of climate and site are factors of major importance that must be considered. These factors usually dictate the ultimate shape of the ward unit, and indeed the entire hospital in tropical and semi-tropical regions.

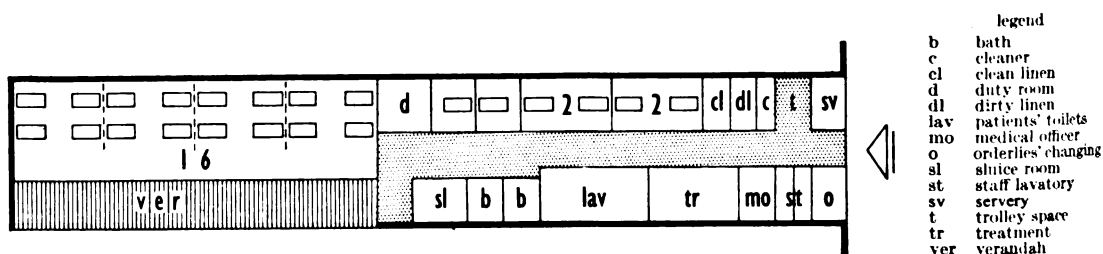


Fig. 2. Ward layout, B.M.H., Benghazi

This is exemplified in a hospital built in North Africa (B.M.H., Benghazi), where the ward unit has the same long narrow shape as the Nightingale ward, except that it is 32 feet wide against the traditional 24 feet. However, it can be seen from Fig. 2 that the layout has broken with the Nightingale tradition, as the ward has been developed in an entirely different way. It is in fact the first Army hospital that has been built on lines other than the Nightingale pattern. The principal features are :

- (a) The ward ancillaries are greatly increased in both size and number, being concentrated at the entrance and one side of the ward unit—on the sunny side.

- (b) The wards, in one-, two-, and four-bedded units, are located along the shady side, so that patients can obtain benefit from the prevailing wind.
- (c) The verandahs, on the predominantly sunny side, act as a sun screen as well as a day space.

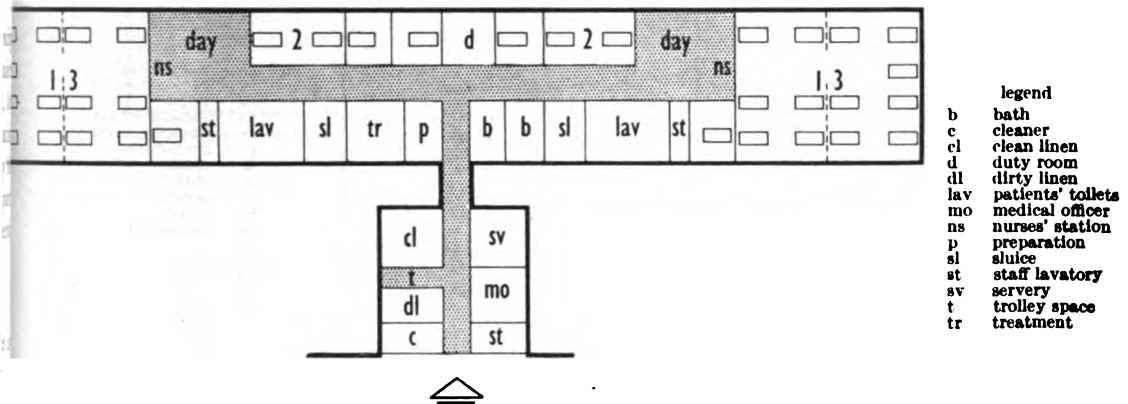
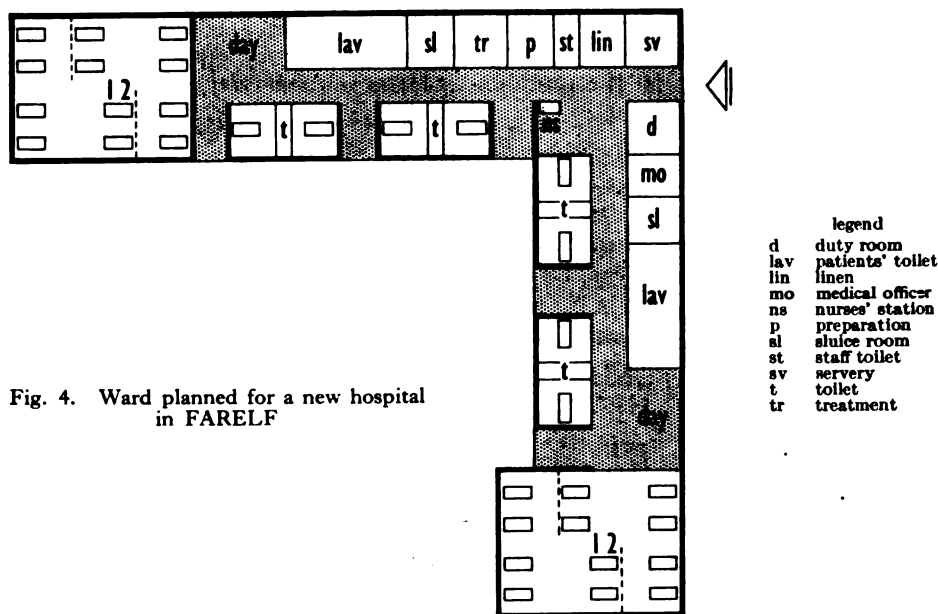


Fig. 3. T-shaped Ward. Planned for B.M.H., Gurgi

Subsequently a T-shaped ward (Fig. 3) was developed which was also planned for a small single-storey hospital in North Africa (B.M.H., Gurgi) but was not built. By far the most important consideration was again that of climate. Sun protection from both heat and glare was essential, also cross-ventilation so as to enable patients to obtain benefit from the cool northerly wind. The building was orientated east and west with single- and double-bedded rooms placed on the shady northerly aspect. The ward units were much larger than at Benghazi and were so planned to have their large windows in opposing positions to give maximum ventilation. Corridor partitions to all rooms were designed to have their upper half opening in the form of clerestory windows, thus giving both light and air to the corridors. The underlying principle of this layout was to centralise ancillaries and small wards (for seriously ill patients) and to place large multi-bedded wards at either end. By this means it was hoped to lessen noise for the majority of patients and to reduce the distance the nursing staff would have to travel in the execution of their duties.

The layout of a ward unit at Fig. 4 is taken from a plan for a proposed new hospital in FARELF. The dog-leg shape of the ward is dictated by a difficult site (uneven and undeveloped). However, it displays a considerable amount of flexibility, coupled with all the requirements of current hospital planning.

When large hospitals are planned, the limitations of site present further problems. Providing the site is large enough a single-storey hospital of any number of beds can be tailor-made to suit the particular medical requirements —i.e. the breakdown of beds by categories. However, if the site is restricted, a multi-storey building offers the best solution, the disadvantage being that

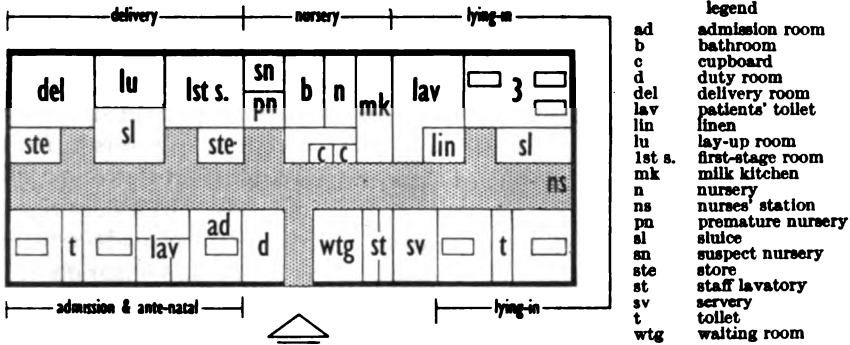


each floor, and, generally speaking, each ward, has to conform to a given pattern irrespective of the number of beds required for each type of patient (medical, surgical, maternity, families, officers, isolation, etc.). Therefore, any multi-storey hospital must be designed to afford maximum flexibility for the treatment of different types of case.

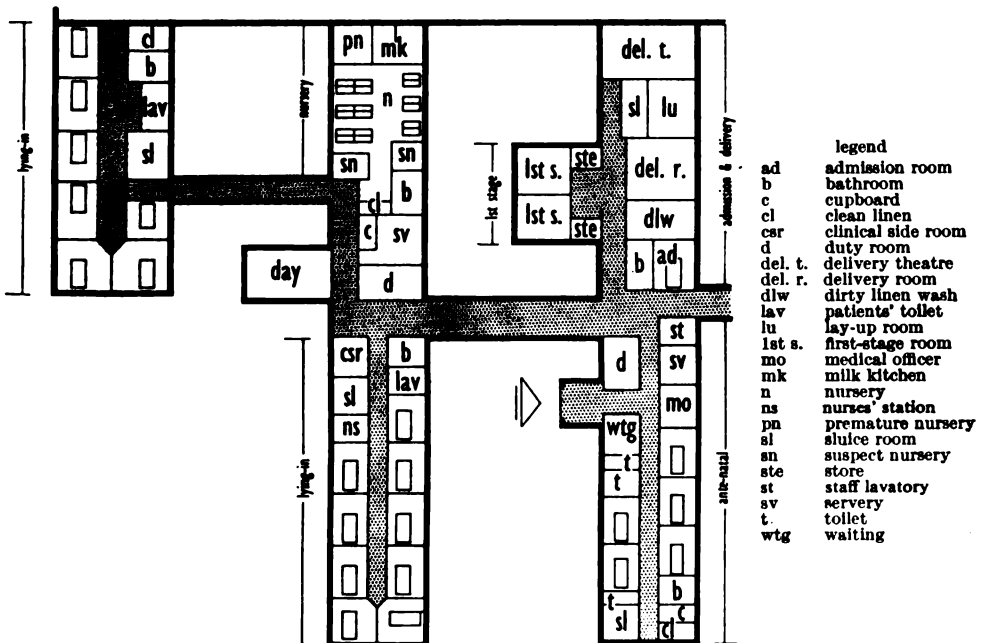
SPECIALISED WARD UNITS

Maternity unit. It is preferable to site the Maternity Unit physically apart from the main portion of the hospital. This should ensure that the staff detailed to nurse maternity cases is not misappropriated for general nursing duties and hence the introduction of infection tends to be kept to a minimum.

Of the total number of maternity beds provided, 25 per cent should be set aside for antenatal cases. Provision should always be made for potentially infectious cases, by the introduction of one or two beds that can be isolated as and when required. It is recommended that at least 50 per cent of the total number of beds should be in single rooms, and the remainder in small units with individual bed partitions. It cannot be sufficiently stressed that the demands for privacy are never greater than in a maternity ward. An admission room, to which all women in labour are initially admitted, is an essential part of the ward. It is in this room, which must include toilet facilities and a bath or shower suitably partitioned off, that the patient is "prepared" before her delivery. The practice of accommodating more than one patient in a first-stage room is strongly deprecated. In spite of the shortage of staff a woman in labour should not be burdened with the company of other patients. Each first-stage room must be large enough for a patient to walk about when she so desires, and will



include a bed for her to rest on during the second half of the first stage of her labour. The patient should only be transferred to a delivery room at the commencement of the second stage, where she remains until the confinement is completed. It will be appreciated that each patient spends a longer period in the first-stage room than in the delivery room, and therefore the proportion should be two first-stage rooms to one delivery room. In all except very small maternity units there should be at least two delivery rooms, one of which must be large enough for use as a delivery theatre. Scrub-up facilities should be provided within the delivery rooms, so that doctors and midwives can keep



the patient under constant supervision. In small maternity units (see Fig. 5) the first-stage room should be made large enough to take an emergency delivery in order to provide adequate facilities in the event of two deliveries occurring at the same time. The presence of two beds in a delivery room is condemned as primitive, and should never be allowed. The layout at Fig. 6 is a plan for a 21-bed maternity unit that is in the process of rehabilitation at Catterick Military Hospital. This should not be interpreted as an ideal layout, but it does represent, within the confines of a narrow framework, an attempt to provide a maternity unit based on current concepts of obstetric practice. The flow diagram at Fig. 7 is a diagrammatic representation portraying the sequence of movement in a maternity unit.

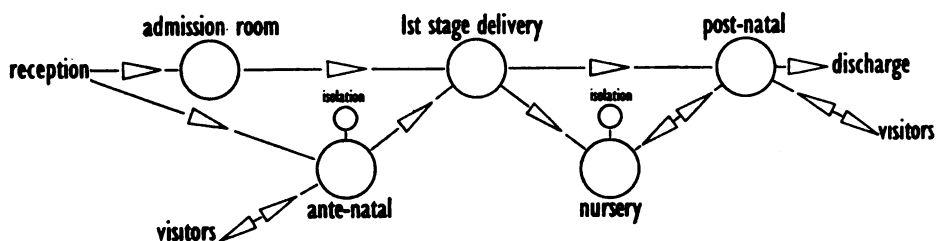


Fig. 7. Sequence of movement in a Maternity Ward

Pædiatric ward. It is now well established in civilian practice that all children from 0 to 14 years should be under the care of a pædiatrician with a special team of nurses, and should be accommodated in a separate ward. Children should not be nursed in an adult general ward. To meet this requirement a plan is being worked out to convert two wards at the Cambridge Military Hospital (Fig. 8). This will form the nucleus of a pædiatric unit which is to be the first to be established in a military hospital in the United Kingdom. The principal feature of this proposed ward is the provision of isolation rooms which have been designed with full height glass partitions. Each room will contain a cot or bed and a baby's bath, which can be used for bathing the baby as well as for the

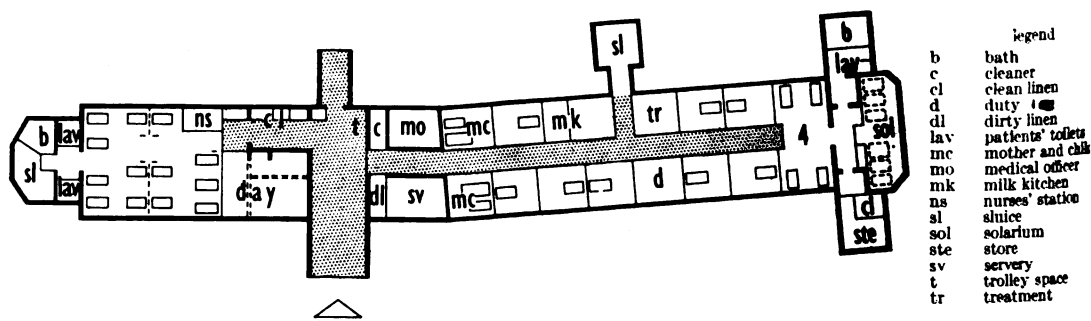


Fig. 8. A Pædiatric Unit

washing of hands. Suitable provision is also being made so that, when desirable on medical grounds, a mother can be accommodated in the same cubicle as her baby. In this way both nursing and breast-feeding will be facilitated. Besides the customary ancillaries which are similar to those for the general ward, there should be a centrally situated milk kitchen in addition to the ward servery. The milk kitchen, suitably partitioned into clean and dirty sides, is for the sole purpose of the preparation of infants' food. Adequate playing space for older children, who are allowed up, and a balcony or verandah where cots and beds can be wheeled into the fresh air and sunshine are essentials which ought always to be included.

SUMMARY

It has only been possible to include in this paper certain aspects of recent advances in hospital planning as applicable to military hospitals. Reference has been made to general ward development and two specialist departments, —i.e. maternity and pædiatric wards.

I am indebted to the Superintending Architect, War Office, C. A. Richards, O.B.E., A.R.I.B.A., and to his staff, particularly W. M. Clarkson, Ph.D., M.Sc., A.R.I.B.A., who has given much help in the preparation of this paper and who has kindly supplied the diagrams.

THE ROYAL SOCIETY INTERNATIONAL GEOPHYSICAL YEAR EXPEDITION TO ANTARCTICA

BY

Colonel R. A. SMART, C.B.E., M.B., D.P.H.

Royal Army Medical Corps

THE International Geophysical Year which commenced on 1st July, 1957, is the third such venture in international scientific co-operation. It was preceded by the First Polar Year in 1882-83 and the Second Polar Year in 1932-33. The proposal to hold a Third Polar Year was first mooted in 1950, was adopted by the International Council of Scientific Unions, and its scope was extended until an ambitious world-wide programme of studies was planned. It was decided that the "Year" would last, in fact, for eighteen months, from 1st July, 1957, to 31st December, 1958. This period was chosen because it was expected to coincide with a peak in the eleven-year sun-spot cycle, and indeed the main purpose of the I.G.Y. is to study the effects upon the earth of solar activity. Preparations were set afoot for a network of scientific stations all over the world to carry out a co-ordinated series of observations during the chosen period. The work includes meteorology, geomagnetism, and many other studies including those of the ionosphere, aurora and cosmic rays. It is clear that a very considerable organisation would be required to co-ordinate a programme of this magnitude, and in order to do this an international body known

as the Special Committee for the International Geophysical Year was set up. On a national level, each of the participating nations has its own committee. The British National Committee was set up in 1952 by the Royal Society, which represents the United Kingdom in international scientific affairs.

In the course of these preparations there has been strong emphasis upon the Antarctic, and at a meeting in Rome in 1954 the Vahsel Bay area of the Weddell Sea was listed as a suitable site for an I.G.Y. station. Subsequently, at the first Antarctic conference in Paris in 1955, the Royal Society declared its intention of establishing a base in the Weddell Sea.

Advance party

The foregoing paragraphs have briefly summarised the events leading up to the despatch of the expedition, which, it was decided, should consist of an advance and a main party. In 1955, the Royal Society selected an advance party of ten men, under the command of Surgeon Lieut.-Commander David Dalgliesh, R.N. It included two serving soldiers, Major G. E. Watson, R.E.M.E., and Sergeant C. F. LeFeuvre, Royal Signals. The first ship chartered for the advance party was the M.V. *Jopeter*, but she was caught in the Greenland ice pack in September, 1955, and the choice then fell upon M.V. *Tottan*. This small Norwegian sealer of 540 tons, commanded by Captain Leif Jakobsen, was to play a big part in the success of the expedition in this and subsequent years.

The advance party sailed from Southampton in M.V. *Tottan* on 22nd November, 1955. Instructions to the leader were to establish a base on the Weddell Sea south of latitude 75. The *Tottan* penetrated as far as 76.31 S, but was held up by heavy pack ice and could go no farther. Search was therefore pursued farther to the north and a suitable site was found on 6th January, 1956, in 75.31 S, 26.36 W, in Coats Land. Here a gentle slope led from the sea ice up to the top of the massive ice shelf on which the base was to be established. A reconnaissance of this area showed it to be apparently free from crevasses, and a suitable site for the base was chosen about one and three-quarter miles from the sea edge of the ice shelf. There the advance party established themselves, living in tents, and began their task which was to build a living hut and to undertake preliminary scientific studies. They had brought with them 220 tons of stores. Good progress was made with the 130-foot-long prefabricated hut, and they were able to move into part of it towards the end of February, 1956. During the year, the base was named Royal Society Base, and the bay where the expedition landed was named Halley Bay, to commemorate the tercentenary of Edmond Halley, who had at one time been Secretary of the Royal Society.

It may be recalled that, while the *Tottan* was searching for a base in the Weddell Sea area, the advance party of the Commonwealth Transantarctic Expedition under command of Dr. V. E. Fuchs was similarly engaged in the Canadian vessel M.V. *Theron*. It had been anticipated that the two expeditions would establish their bases in the same locality, and be of assistance to each other in a variety of ways. However, the *Theron* was beset for more than three weeks, and during that time the advance party of the Royal Society expedition

selected the site at Halley Bay. After the *Theron* was released from the ice, Dr. Fuchs headed south again. He surveyed the Halley Bay area, but decided that it would not be suitable as a jumping-off base for the transantarctic journey, as it was hemmed in at a distance by vast crevasse fields. He therefore continued his journey south, and in due course reached Vahsel Bay, where he disembarked his advance party to establish Shackleton Base at 77.57 S, 37.16 W. He then returned to the United Kingdom in the *Theron* to make preparations for the coming year.

Main party

While the advance party of the Royal Society expedition was engaged in this important year of preliminary work, the main party, with its stores and equipment, was being assembled in the United Kingdom. I was appointed as leader in September, 1956. The appointment was for one year only, which would cover the build-up of the base and the first six full working months of the I.G.Y. I was seconded from the Army for a period of approximately sixteen months to enable me to do this. At the time when I was appointed, over half of the members of the expedition, including all of the members of the scientific groups, had already been selected. In the period of less than two months remaining, the other members of the expedition, in particular carpenters, diesel mechanics, and cooks, were selected from a very large number of applicants. The War Office generously released three serving soldiers, Staff-Sergeant A. Amphlett, R.E.M.E., Sergeant I. Beney, R.E., as diesel/electric mechanics, and Sergeant M. Edwards, A.C.C., as cook. The first two were Regular soldiers, the latter was a National Service man who signed on for three years on being selected. The whole party consisted of twenty men, eleven of whom were engaged in geophysical work, the others being two radio operators, two diesel mechanics, two carpenters, two cooks, and myself as leader and medical officer.

Assembly of stores and equipment had been going on over the course of the year, based partly on scales already established by the Falkland Islands Dependencies Survey, partly on recommendations sent back by the advance party, and partly on special requirements of the main party. In the time left available to me before departure, there was little to do on the stores side except to give decisions on points which had been specifically left for the leader to decide, and to scrutinise lists of rations, medical supplies and so on, suggesting additions where it appeared necessary. Thus I was spared the detailed work on stores, which was ably done by G. E. Hemmen, our stores officer, but I was able to exercise freedom of choice on certain special points affecting clothing and general equipment.

The pace became extremely hectic in the last few weeks before departure, and memories remain of intense activity in telephone boxes, press conferences, selection interviews, meetings on stores and equipment, visits to private firms and to testing centres.

The ship chartered for the southern journey was the M.V. *Magga Dan*, which was to be shared with the Transantarctic Expedition. As it became

apparent that the volume of stores to be taken with the two expeditions was too great for the *Magga Dan* alone, the M.V. *Tottan* was chartered for the second year in succession, to take approximately 120 tons of stores for the Royal Society Expedition.

The date fixed for departure was 15th November, 1956, and the *Magga Dan* was to leave from Butler's Wharf, Tower Bridge. On 13th November, we were honoured by a visit from Her Majesty The Queen, who came to Butler's Wharf and inspected the ship. All members of the two expeditions were presented to her.

On 15th November, the *Magga Dan* sailed at noon. We were given a tremendous send-off by a huge crowd, and as we sailed down the Thames on that misty November day, mixed with all our other emotions we looked forward greatly to the relaxation and peace that the first few weeks of the long voyage would bring, after the intense activity which preceded our departure.

The southern voyage

The *Magga Dan*, a modern ship of 1,850 tons completed in 1956, was commanded by Captain Hans Christian Petersen. The standard of comfort on board was very high, with well-appointed cabins, air-conditioned for comfort both in polar and tropical regions. On the voyage south we called at Madeira, Montevideo, and finally South Georgia, the last port of call before entering the ice. Here we took our last opportunity of taking on fresh provisions.

We entered pack ice on 23rd December and made good progress to the south, crossing the Antarctic circle on 27th December. In the meantime, we had celebrated Christmas in our own way, and also according to Danish custom. The *Magga Dan* is built for ice work, having specially shaped and strengthened bows, powerful engines, and a completely enclosed and heated crow's nest, from which the ship can be controlled by duplicate instruments, and to which access is given by a ladder inside a hollow mast. This last feature of construction seemed to appeal specially to public interest at the time of departure.

In the course of the first few days, we were stopped a number of times by close, heavy pack ice, and on two occasions the ship stuck fast, being unable to move forwards or backwards. We freed her on both occasions by getting over the side and chipping away the ice gradually with iron crowbars. In this way, and aided by reconnaissance flights made by the Transantarctic Expedition's Auster, we made our way slowly to the south, and on 3rd January, 1957, we reached the open shore lead which is known to exist during the few short summer months off the east coast of the Weddell Sea. Halley Bay was reached in the afternoon of 4th January, when we rounded the ice headland to find the *Tottan* already moored alongside the edge, having arrived some hours previously. Surgeon Lieut.-Commander Dalglish and the members of the advance party were waiting at the ice edge to greet us, and the Ferguson tractors were drawn up behind them. As soon as we tied up they boarded the ship, and the remainder of the day passed very quickly in exchange of news, distribution of mail, and visits to the base hut which was to be our future home.



[Central Press Photos Ltd.]

The M.V. *Tottan* and the M.S. *Magga Dan* moored alongside the ice edge at Halley Bay.



Main Base Hut, Royal Society Base, Halley Bay, after winter's accumulation of snow. Building materials for generator hut and pile of stores in the background with the all-sky camera on the left.

Unloading

Plans for unloading had been drawn up during the voyage and they were now put into effect, commencing at 0600 hours on 5th January. The task was to unload 380 tons of stores from the *Magga Dan*, and 120 tons from the *Tottan* as rapidly as possible, and transport them to the base site. To do this we had three Ferguson diesel tractors, three Maudheim sledges, and five Army cargo sledges. In addition we had the assistance of one Muskeg tractor which we shared with the Transantarctic Expedition for unloading. We had brought with us eight bridges, each of twenty-foot span, in case we had to unload over cracks in the sea ice, but they were not required.

We now embarked upon a period of hard physical work, commencing at 0600 hours daily and stopping at 2000 hours. All equipment was loaded on to sledges as soon as it was slung off the ship. Stores were not allowed to accumulate on the bay ice, as this was always liable to break off, and result in loss.

Some very heavy equipment had to be moved, notably two Meadows generators weighing $2\frac{1}{2}$ tons each, which were vital to the whole programme, the Decca radar equipment weighing $1\frac{1}{2}$ tons, and a number of other items of comparable weight. These were, however, landed and moved to the base site without great difficulty.

Weather throughout this period was good. On many days we had blazing sunshine, resulting in quite severe sunburn of the face in spite of protective creams. Two cases of snowblindness occurring at this time were caused, not by complete neglect of precautions, but by pushing goggles up on to the forehead for long periods in one case, and in the other, wearing sunglasses in place of goggles. Both of these men were out of action for two days.

Snow surfaces were soft to begin with, and tractors bogged down easily. As the surfaces were used more they compacted quickly, and a further improvement in haulage was brought about by converting our half tracks to full tracks. These conversions were done at night without interruption to the unloading programme.

All crates were numbered, and bore their number on all six sides for ease of sorting. At the base site they were dumped at eleven prearranged and marked sites, located so that the future drifts they would cause would not interfere with any other structure on the site. Subsequently the crates were mounted on platforms, and arranged in numerical order. The platform mounting was intended to keep the stores clear of drift snow for as long as possible. The result of these arrangements was that it was comparatively easy to find any item out of the very great number contained in our 500 tons of stores.

In addition to stores and equipment, we carried seven prefabricated huts. They were colour-marked, their parts numbered, and were dumped directly at the sites chosen for their erection.

Unloading of the *Magga Dan* was completed on 11th January, and she sailed for Vahsel Bay on 12th January, taking with her all members of our advance party.

Dr. Fuchs left by air for his base a few hours earlier. The day before he

left, on 11th January, the Otter aircraft made a flight eastward from Halley Bay. Piloted by Squadron-Leader John Lewis, it carried Dr. Fuchs, George Lowe, Surgeon Lieut.-Commander Dalglish, and myself. The main object was to find a mountain range which had been seen from Halley Bay under conditions of abnormal visibility the previous year. About 230 miles east of Halley Bay we found this new range, flew over it, and photographed it for the first time. The height of the range was estimated at about 9,000 feet. It lies in the Norwegian Antarctic sector and the name proposed for it is Tottanfjellene.

After the *Magga Dan* departed, we still had to unload *Tottan*. This was completed at 0100 hours on 14th January, after a nineteen-hour working day, a really special effort. The ship left almost immediately afterwards.

Building

We were now ready to commence the building programme. The task was to erect seven prefabricated huts in the shortest possible time. We expected the weather to deteriorate sometime in March, and we aimed at completing all outside construction before the weather began to make such work difficult, and therefore slower.

The huts to be built were a rather large and complicated geomagnetic hut, the balloon hut, a generator hut, and a radio-echo hut. Finally, there were three smaller sledge-mounted huts for use at the remote aerial sites.

Construction commenced on 14th January. There were two main working groups each under the supervision of a carpenter. Preparations for this phase had begun on the *Magga Dan*, the working groups being detailed in advance, and given an opportunity to study the building plans. The first buildings to go up were the geomagnetic hut and the generator hut. The former, prefabricated as were all our huts by Messrs. Boulton and Paul of Norwich, was of immensely strong construction and made of non-magnetic materials. In the course of construction, the greatest care had to be taken that no ferrous materials were left on the site, tools were carefully accounted for, and even nails from packing cases were meticulously gathered up. Another special feature was the mounting of the instrument pillars on thirteen wooden piles driven twenty feet into the snow by means of a pile driver. The main outer structure was finished on 28th January, and on the same date work was started on two other huts, the balloon and radio-echo huts. These were, on the whole, less complicated buildings, and the outer structures were completed by 12th February. From that time on we had no fear that our building programme could be hampered by the weather. We reached this stage so quickly by working a fourteen-hour day, combined with very favourable weather throughout the whole of the initial building period.

Besides hut building, the erection of aerals was going on at this time, and by 12th February, an array of eight fifty-foot aerial masts had been erected, and one seventy-eight-foot mast, the latter being for ionospheric work.

During this stage of active outdoor work general health was extremely good and a high level of physical fitness was quickly reached. Appetites were

voracious. We could see immediate tangible results from the work we were doing, and this was a most rewarding time. There were a few minor injuries during the unloading and building period, but all were trivial.

Commencement of the I.G.Y.

The advance trial of the I.G.Y. commenced on 20th June, and the I.G.Y. itself began on 1st July. The months between the completion of hut building, and the commencement of the I.G.Y. were passed in the installation, testing, calibration, and adjustment of scientific equipment. The programme of work which is being carried out at Halley Bay includes meteorology, both surface and upper air; geomagnetism; ionospheric studies; observation of the aurora, both visual and by all-sky camera; studies of aurora and meteor showers by radio-echo; and study of radio sources in distant stars. From the foregoing, it will be obvious that there was a great deal of specialised equipment to be installed, and much preliminary work to be done. A special problem was the elimination of interference between the various items of equipment. In particular, our communications transmitter had to be restricted to certain frequencies and certain times. The generator shed had to be completely screened with aluminium sheeting inside, and the humidity to be kept up to a certain level in order to minimise brush wear and electrical noise. These and similar problems were typical of the work of the base in the months immediately preceding I.G.Y. The scientists responsible for the various programmes gradually solved their particular problems, and on 19th June I was able to report to the Royal Society that the base was fully prepared and ready for the work of the I.G.Y. This duly commenced as an advance trial on 20th June, and the eighteen months' programme of intensive scientific work began on 1st July, 1957.

General living and working conditions

The base hut in which we lived was 130 feet long, and there were virtually two stories. It was built to withstand the pressure of tons of snow which would eventually cover the roof. There were two bunkrooms, one with twelve and the other with ten bunks. Living in this style, there was not a great deal of privacy for anyone, but in time, each man established his right to some nook or cranny of the hut which he could call his own, in addition to his bunk. Kitchen and dining compartment were in one unit separated by a serving partition. There was one comfortable living-room, with a bar at one end, bookshelves, and a record player. This room had been imaginatively decorated by the advance party in "Old English" style, with rafters, lanterns, and brick fireplace. The illusion was only shattered when one pulled aside the curtains and looked out into the ice tunnel which ran along that side of the hut.

Heating was by anthracite stoves in all communal rooms and by electric heaters in some of the other departments. Heating was very efficient, and some of the rooms were occasionally too hot, although when conditions outside were extreme, the temperature in certain departments was lowered to a degree which made sedentary work uncomfortable.

Everyone took it in turn to do the domestic work of the hut, except for the cooks, who already did their share in the course of their daily work. "Gash duty," as it was called, came round to each individual in turn about once a fortnight. The main part of the work consisted of washing-up the dishes after each meal, cutting the snow blocks to top up the water tanks which supplied us with drinking, cooking and washing water, cleaning and topping-up the heating stoves, and generally cleaning-up the hut.

The advantages and disadvantages of having full-time cooks on an expedition have often been discussed. We had two full-time cooks, and the system worked very well. Rations were on an ample scale, but mainly tinned. Vegetables were tinned or dehydrated. We had sufficient frozen carcasses to give us fresh meat about once a week. Compound vitamin tablets were on the table at every meal.

We had good bathing arrangements, and for each individual, bath day came round once every ten days. On that day, one could have a hot, full-length bath, and wash all one's clothes in an electric washing machine. This was a much-appreciated luxury, the only restriction on its use being that it could not be used at the same time as the radar. The disadvantage attendant upon bathing was that the waste water had to be run off into buckets, and carried outside to be poured down the waste hole, which was not an attractive finish to a hot bath when it was blowing outside. Towards the end of the year, however, a system of drainage was evolved by which all waste water was carried away by pipes, and this was a considerable addition to our comfort. In general, disposal of all waste was a simple matter.

The use of leisure time presented no problem. In the first place, there was very much less leisure time than might be supposed. The scientific work of the base went on twenty-four hours a day. On any one particular evening, those who were not working would be reading, listening to the record player, washing or mending clothes, or playing chess or darts. Cards were seldom played. In summer, there was always someone out walking, ski-ing, or visiting the Emperor penguin rookery two and a half miles distant. This was of exceptional interest, but considerations of space prevent further description here. Observation of the rookery was continued throughout the year, and a series of embryos was collected.

Our main evening for recreation was Saturday, when we usually showed a film on the 16-mm. projector, and had our weekly issue of one can of beer, and a limited ration of spirits.

Winter

Careful preparations were made so that the work of the base could be continued without interruption during the winter months. Outside lights were fitted over all the huts, and guide ropes leading from hut to hut were mounted shoulder high on stout stakes driven well into the snow. In addition, telephones were installed at all outlying huts. The base hut was stocked with as much anthracite as our store would hold and we brought in as much food as could conveniently be stored. These preparations were more than adequate,

and throughout the whole of the winter we were not deterred by bad weather from carrying out routine work outside. The mean monthly temperature was -23.4° C. in June, -27.2° C. in July, and -32.3° C. in August. The lowest temperature during the year was -50.6° C. (-59.1° F.) in July. The maximum sustained wind was 60 knots in July, and the maximum gust 77 knots in June. The sun was last seen before winter on the 29th April ; it rose again above the horizon on 12th August. During the darkest winter days, when high wind and drift reduced visibility to three or four yards, it was still possible, although only just, to move about the base site, and go from hut to hut by means of the guide ropes. Meteorological balloons were launched twice a day throughout the winter in winds of up to 47 knots.

The main celebration of the year in the Antarctic falls on Midwinter's Day, 21st June. On that day in 1957, we rummaged in the depths of kitbags for jackets, collars and ties, although the latter items were inconspicuous when worn beneath heavy beards. In any case, we appeared as respectably dressed as was possible in our circumstances, and enjoyed a very fine lunch. A hamper, presented by the Royal Society, contributed many delicacies to make this really an outstanding menu. This excellent lunch was concluded by toasts and speeches. A feature of Midwinter's Day was the exchange of radio messages with other Antarctic bases, and with the United Kingdom. So far as I personally was concerned, the occasion was very conveniently combined with the celebration of Corps Day on 23rd June.

Communications

Equipped with a 750-watt transmitter, we maintained excellent touch with the outside world throughout the year. Our main contact was with Port Stanley in the Falkland Islands, some 1,800 miles to our north. The main part of our traffic to London passed through this station, but we also had a regular direct link with London. We were in daily touch with many Antarctic bases : the Transantarctic Expedition at Shackleton Base, our nearest neighbours, the Australian Base at Vestfold Hills, the Russian Base at Mirny, French Base in Terre Adelie, the Japanese Syowa Base and Norway Station. With all of these, we exchanged meteorological information, usually daily, as well as general news and greetings on special occasions. We were also in occasional touch with the American Bases at the South Pole, and at Ellsworth on the Weddell Sea. Towards the end of the year, we had a radio-telephone link with the United Kingdom, on which private calls could be made at a very reasonable rate. To be told one was wanted on the telephone made it difficult to realise our isolation. The publication of a daily news-sheet also brought the outside world nearer, a fact which many people deplored.

Journeys

With the return of the sun on 12th August, preparations for spring and summer journeys were intensified. There was no provision for travelling in the programme, and as everyone was really very fully occupied on the planned work

of the base, the time and opportunity for making journeys was restricted. Nevertheless, we were naturally keen to find out as much as we could about what lay around us, and a number of limited journeys was undertaken. As we had no dogs, sledges had to be man-hauled. Every journey was undertaken with some definite object in view, and systematic topographical, meteorological, and glaciological observations were made on each. On an average, we undertook about one journey a month, except during the winter. Journeys lasted three to seven days, and covered distances of over seventy miles. This sort of activity was very useful in providing a change from base routine, increasing physical fitness and self-confidence, and in providing us with useful information about the ice shelf on which we lived. Amongst other points, we established that the position of our base was some thirty-five miles from the coast of the Antarctic continent, on a great shelf extending out to sea.

Medical

In general, the health of the party was excellent throughout the year, and there was very little medical work to be done. Effects of climate were not severe. As I have previously described, there were cases of severe sunburn at the time of unloading. Faces and lips were puffed, cracked, and oozing, to such an extent that speaking and eating were uncomfortable for a time, and this despite the use of various protective applications. Then there were the two cases of severe snowblindness in the early part of January, and two mild cases in November, before it was generally appreciated that the sun's rays were again becoming intense. None of these cases was caused by complete neglect of precautions, but arose from overestimating the amount of exposure necessary to cause damage.

There were no serious cases of frost-bite, but there were naturally many instances of minor frost-bite of nose, cheeks and fingers. These occasionally progressed as far as blistering. They occurred most frequently when equipment had to be repaired or adjusted out in the open under severe conditions. There was, for example, one occasion when the anemometer at the top of a thirty-six-foot tower had to be changed in a twenty-knot wind at a temperature of -51° F. Under these conditions, although silk or chamois gloves were worn for finger work, the operator could hardly expect to escape a frost-bite of some degree.

There was a certain amount of dental work to be done, but not a great deal in this first year, as all members of the expedition were dentally fit before leaving the United Kingdom. No extractions were necessary during the year, but I did sixteen fillings in the hope that they might be semi-permanent. Most were in oxyphosphate cement, which was easy to handle, and seemed reasonably durable. Amalgam was available, but was not used owing to the inexperience of the operator. The equipment included an electric drill, which was found most useful, but it was perhaps a unique feature of dental practice at Halley Bay that drilling had to be phased to the ionospheric programme to avoid interference.

Some physiological observations were made, in that every man was weighed

monthly, and a series of fat-thickness measurements were taken in selected parts of the body, with special calipers provided by the Medical Research Council. The object was to determine whether there was any seasonal variation in weight and fat-thickness in Polar regions. In addition, records were kept of hours of sleep, clothing worn daily, and the climatic conditions under which such clothing was worn.

There were no acclimatisation studies. There is, however, no doubt in anyone's mind that, purely subjectively, there was a marked degree of acclimatisation, and that at the end of the winter, weather which we would previously have regarded as severe passed almost unnoticed.

Psychologically, the effects of close confinement of a party of twenty men in a hut over winter were very much as one might expect. There were two or three individuals who showed some irritability, usually allied with insomnia, during the winter months, but this did not attain serious proportions. The fact that we were a static base, without any spectacular achievement to look forward to, and faced with a long period of intensive work on a fixed programme no doubt aggravated whatever strain was imposed upon individuals by their surroundings. In general, it is satisfactory to be able to say that the party got on very well together. Good humour and tolerance are the saving graces under these circumstances.

Relief ship

The relief ship at the end of 1957 was again the *M.V. Tottan*. On this occasion she was also carrying out the annual relief of the Norwegian Antarctic Expedition. After visiting Norway Base, she arrived at Halley Bay on the morning of 31st December, bringing stores for the coming year, great quantities of personal mail, and relief personnel. This was the third year in succession that the *Tottan* had made a successful voyage into the Weddell Sea, and she was the first ship in this season. The day was cheerfully spent in exchange of news and distribution of mail, and Hogmanay was celebrated in the base hut in company with the new arrivals. They comprised a medical officer, Flight-Lieutenant Brooker, R.A.F., two meteorologists, and a radio operator. Those returning to the United Kingdom, in addition to myself, consisted of the two carpenters, for whom there was insufficient work in the second year; one radio operator who had developed a visual defect in April, 1957; and one meteorologist, Peter Jeffries, who had joined us in January, 1957, having spent the previous year at Shackleton Base. I handed over command to Joe Macdowall, who had been leader of the meteorological group in 1957. The result of these moves was a change in the balance of the party, resulting in the greatest possible number being engaged in geophysical work. This should result in the best possible use being made of the base in 1958. The work of the expedition goes on until the International Geophysical Year comes to an end on 31st December, 1958. Its achievement can ultimately be assessed only after analysis and study by the appropriate bodies of the records available at the end of the I.G.Y.

The *M.V. Tottan* left Halley Bay on 7th January, 1958, reached South

Georgia on 18th January after passing through a full storm in the Scotia Sea, and disembarked returning members of the expedition at Las Palmas in the Canary Islands on 10th February, 1958.

I was given every facility to take part in this expedition, and for this I am most grateful to the Director-General, Army Medical Services.

Extract of a speech made by Dr. H. D. Chalke, O.B.E., T.D., M.R.C.P., D.P.H., in his Presidential address to the Conference of Medical Officers of Health during the Congress of the Royal Society of Health held at Eastbourne on Wednesday, 30th April, 1958.

In this Diamond Jubilee Year of the R.A.M.C., I should like to take the opportunity of paying tribute to the outstanding contribution the Corps has made, not only to the health and welfare of those living under Service conditions, but also to preventive medicine as a whole. During its sixty years the Hygiene (now the Army Health) Branch of the medical service has continued to have an important impact on civilian public health practice.

Perhaps, also, I may be allowed to mention the splendid work accomplished during the Second World War by those members of the public health service who served as Territorial and Emergency Commissioned hygiene officers. They, with their Regular colleagues, in their successful efforts to preserve the health of the troops and minimise manpower losses, gave us a great advantage over our adversaries, which was to prove of inestimable value in achieving final victory.

EPILOGUE

AN EXTRACT FROM THE AUTOBIOGRAPHY OF LIEUT.-GENERAL SIR WILLIAM BUTLER, K.C.B.,¹ who died in 1910.

. . . It now only remained to get into the Bath-chair to which I had also been appointed by the excellent doctor at Netley.

And here I desire to say a word about a body of gentlemen-servants of the State with whom a long active life made me familiar—the medical officers of the army.

I have known them in many lands, and under the varying conditions inevitable to military life. I never knew them to fail. There is no finer sight in war than the figure of a military surgeon kneeling beside a wounded man just behind the fighting line. Shots may come, and shots may go, but the surgeon goes on at his work, quietly, coolly, and with hand as steady and dexterous, and gaze as concentrated on his business, as though the scene were the operating-room in a London hospital.

¹ Constable & Co., Ltd. (1911). p. 171.

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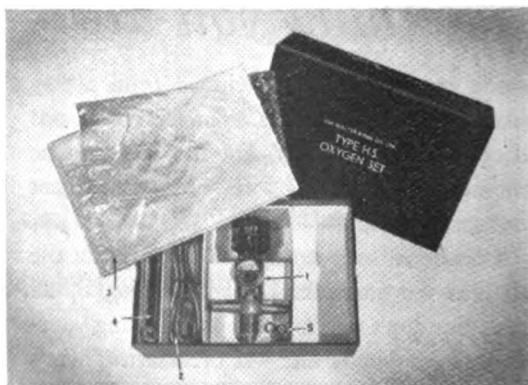
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CONTENTS

	PAGE		PAGE
Address to Physicians of the Allied Forces by the late Pope Pius XII	201	The Investigation of Influenza in the Army in 1957. By Major R. J. C. Hart, M.B., Dip. Bact., R.A.M.C.	232
Burns—The First Five Days in the Treatment of Mass Casualties. By R. J. V. Battle, M.B.E., M.Ch., F.R.C.S.	203	Salmonellosis in Lizards of Ghana. By Major E. E. Vella, R.A.M.C.	236
The Chemoprophylaxis of Gas Gangrene. By L. P. Garrod, M.D., F.R.C.P.	209	Echoes from the Past. No. 1	237
Lung Resection for Tuberculosis in the Army. By Lieut.-Colonel S. E. Large, M.B.E., M.B., M.R.C.P., D.P.H., R.A.M.C., Captain A. N. Laird, M.B., Ch.B., R.A.M.C., and G. Kent Harrison, M.D., F.R.C.S.	216	Ebstein's Disease. By Captain R. S. Williams, M.B., M.R.C.P., R.A.M.C., and Colonel J. A. G. Carmichael, M.R.C.P., R.A.M.C.	238
Construction of a Mass Miniature Radiography Vehicle. By Lieut.-Colonel R. M. Hector, M.B., Ch.B., D.M.R.D., R.A.M.C.	223	Escherichia Coli Gastro-Enteritis in a Military Hospital. By Major J. G. P. Power, M.B., D.P.H., D.T.M. & H., R.A.M.C.	241
Treatment of Crush Injury of the Chest by Intermittent Positive Pressure Respiration and Continuous Curarisation. By J. A. Thornton, M.B., F.F.A.R.C.S., D.A.	226	BOOK REVIEWS	245
		EDITORIAL NOTICES	248

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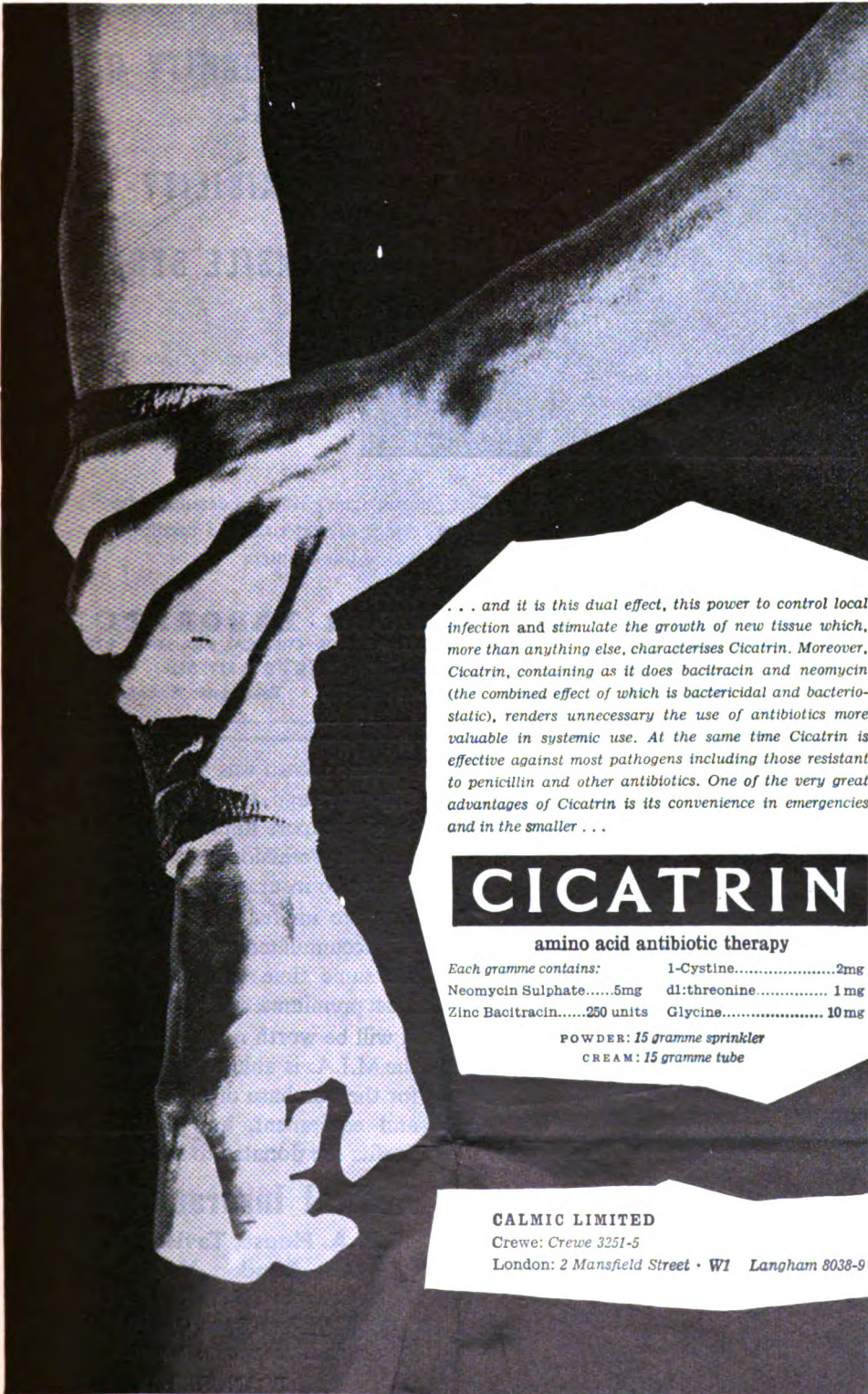
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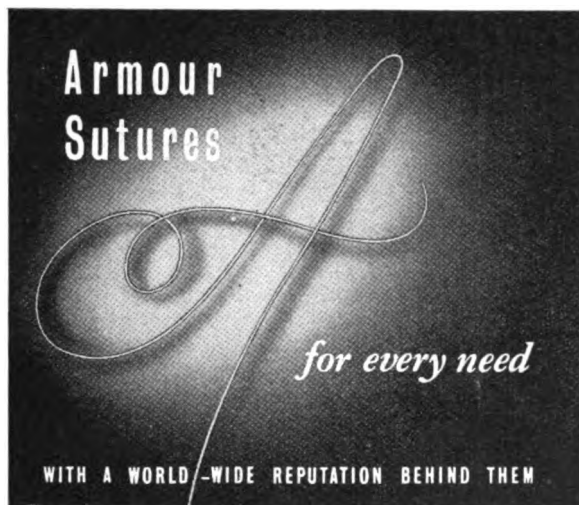
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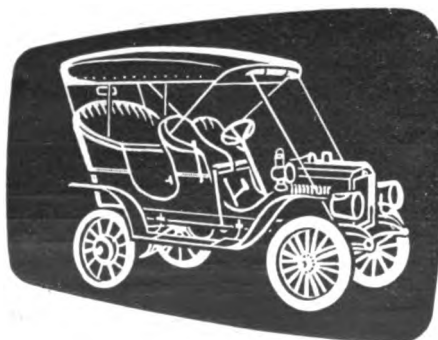


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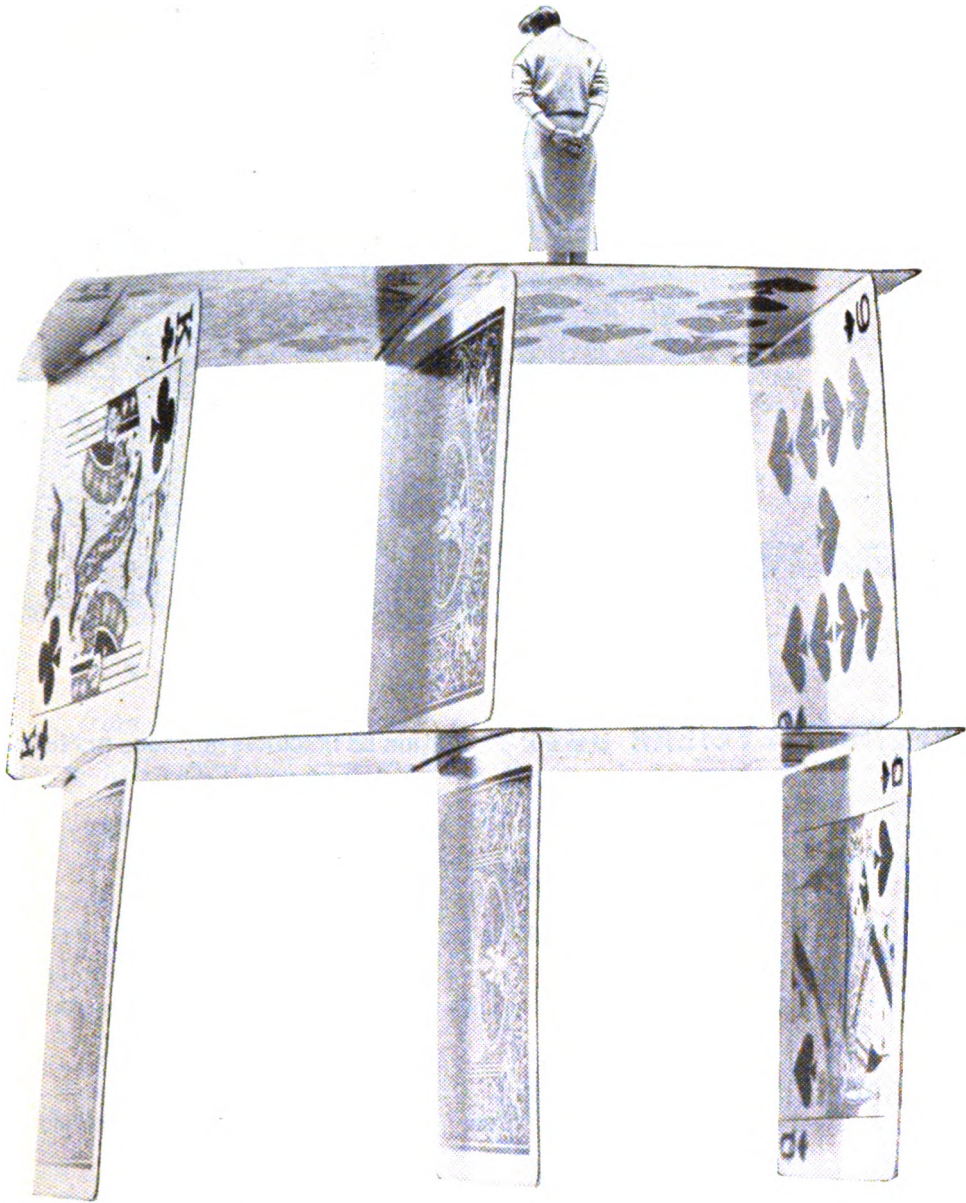
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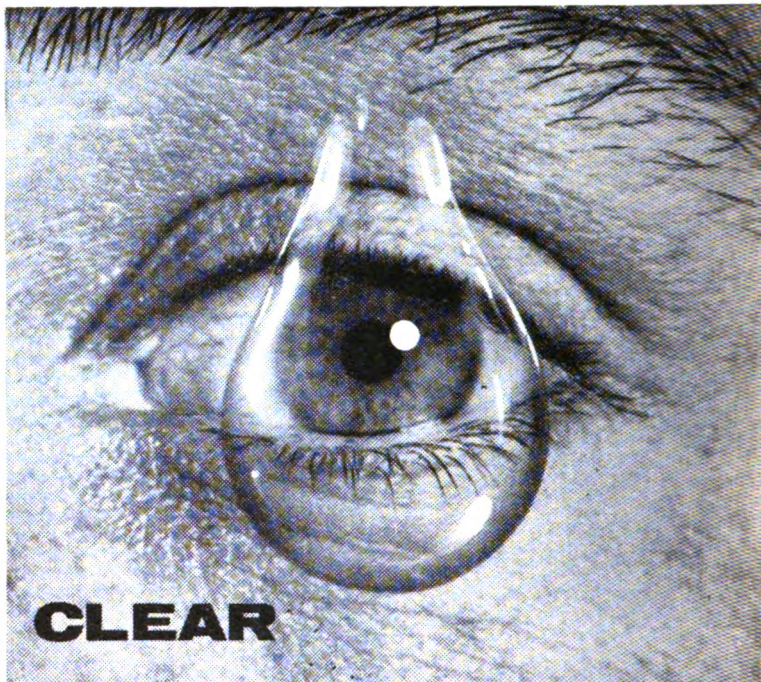
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Journal

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AN ADDRESS TO PHYSICIANS OF THE ALLIED FORCES

By the late POPE PIUS XII

The death of Pope Pius XII affords a suitable opportunity to publish an address he gave to medical specialists of the Allied Forces during the last war, soon after the occupation of Rome.

This appeared as Appendix A to the report of the Consultant Physician, Central Mediterranean Force (Brigadier E. R. Boland, C.B.E., F.R.C.P.), for the first quarter of 1945, a copy of which came into the hands of the Editor and was abstracted by him at the time with permission of the D.M.S., ALFSEA, Major-General W. E. Tyndall, C.B., C.B.E., M.C.

We are indebted to Dr. Boland, Dean of Guy's Hospital Medical School, for the following details of the occasion.

His Holiness Pope Pius XII received in audience on Tuesday, 30th January, 1945, a group of more than 120 specialist physicians belonging to the British, American, Polish and French Armies. The senior officer present was General Stayer, who was Chief Surgeon (American) at Allied Forces Headquarters.

After the address, the Pope shook hands with everyone present and talked in the appropriate language to all the physicians, asking them where they came from and showing, in many cases, knowledge of their home surroundings. At the end of the audience he blessed the assembled body. His command of English, his urbanity and easy grace of manner impressed all the physicians who attended.

YOUR presence, gentlemen, brings vividly before our minds a parable told almost 2,000 years ago by Christ, the divine physician, when He walked so graciously among men. It is the story of the Good Samaritan, and with striking fitness it has been preserved for posterity in the Gospel written by St. Luke, who was himself a doctor. The scene depicted is familiar to you all. A lonely road, a

wounded man, helpless and bleeding, lying on the roadside, evidently a victim of robbers who have stripped him after a rough and violent struggle; the Good Samaritan hurrying home sees him; he turns from his way, dismounts, goes to the suffering stranger, with sympathy examines his wounds, gently applies oil and wine to clean and heal them, lifts him to his horse and carries him to the nearest inn, where he gives orders for his special care. Nothing is to be spared for his complete cure.

The setting may be different from the circumstances that are common in your experience; but the spirit of prompt and unselfish devotion, of lofty principles and inspiring sacrifice of self in the interest of another, of tenderness and love—that is the same spirit that has characterised your profession at all periods of human history.

For the doctor is not handling inert matter, however priceless. Suffering in his hands is a human creature, a man like himself. Like himself, that patient has a post of duty in some family where loving hearts are anxiously awaiting him; he has a mission to fulfil, even though humble, in human society. What is more, that ailing, crippled, pining form has a rendezvous with eternity, and when breath leaves his body, he will there begin an immortal life whose joy or misery will reflect the success or failure before God of his earthly mission. Precious creature of God's love and omnipotence !

Spirit and dust compounded to form an image of the Infinite, living in time and space, yet headed towards a goal that lies beyond both ; part of the created universe, yet destined to share the glory and joy of the Creator ; that man who places himself in the care of a doctor is something more than nerves and tissues, blood and organs. And though the doctor is called in directly to heal the body, he must often give advice, make decisions, formulate principles that affect the spirit of man and his eternal destiny. It is after all the man who is to be treated : a man made up of soul and body, who has temporal interests but also eternal ; and as his temporal interests and responsibility to family and society may not be sacrificed to fitful fancies or desperate desires of passion, so his eternal interests and responsibility to God may never be subordinated to any temporal advantage.

Hence, as we said recently when speaking to the doctors belonging to the Italian Union of St. Luke, hence flows a whole series of principles and practical rules which regulate the use and the right to dispose of the organs and members of the body, and which are mandatory both for the person concerned and the doctor whose advice has been asked. For man is not really the absolute owner and master of his body, but only has the use of it ; and God cannot permit him to use it in a manner contrary to the intrinsic and natural purpose which He has assigned as the function of its diverse parts.

It is clear then, as we observed on the same occasion, how the medical profession places its representatives squarely within the orbit of the moral order, to be governed in their activity by its laws. Whether it be a question of teaching or giving advice or prescribing a cure or applying a remedy, the doctor may not step outside the frontier of morality dissociating himself from the fundamental principles of ethics and religion. His vocation is noble, sublime ;

his responsibility to society is grave ; but God will not fail to bless him for his charity and for his unstinting, devoted efforts to alleviate the sufferings of his fellow-men on earth, so that he may not fall short of the incomparable joys of heaven. It is our most earnest prayer that this blessing may be granted to you all abundantly from the loving bounty of God.

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The depth and area of a burn are closely related to the prognosis. Let us consider two patients in one ward—the one with a very severe (over 50 per cent) full thickness burn, and the other with a partial thickness burn of comparable area. The prognosis with the former is very poor indeed even under good conditions. He is probably delirious, restless and incapable of doing anything at all for himself. He will present no veins for infusion and will require “cutting down.” He will possibly have complete suppression of urine (apart from a small initial blood-stained specimen), and under normal civilian peace-time conditions, the full resources of a skilled team may not succeed in effecting a successful result.

The other patient, however, is in a different category. He may require the same amount of nursing, particularly if his face and hands have been affected, but with adequate fluid therapy he will be able to fend for himself in a few days, and the prognosis is good. Furthermore, no long-term reconstructive problems will arise.

Between these two contrasting cases there is an infinite variety of different types and distributions of burns, for instance the mixed deep burn which in the early days looks superficial and later appears as a much deeper and more serious entity, particularly if it becomes infected. Burns affecting the hands, face and perineum by their interference with function alone can be crippling even though superficial.

TRIAGE

Under conditions of a total disaster leading to mass casualties the sorting of burned patients according to prognosis depends largely on the early recognition of the depth of the burn. The surface area of a burn can readily be estimated even by personnel with no special qualifications, but someone must be available even in the filter unit to decide which patients are to be treated expectantly. The use of a pin prick is a useful guide in the estimation of full thickness skin loss. Where reaction is absent such loss is probable, but there are in fact no reliable clinical tests by which a partial thickness burn can be distinguished from one of full thickness. Only experience can determine this.

In the Filter Unit: It is felt that burns here can be placed on admission into four categories :

(1) *Walking patients.* These would probably consist of patients with a partial thickness burn of part of one limb, mild flash burns, and small areas only of full thickness skin loss. In this group the old and the young—over 50 and under 5—will have to be very carefully observed before evacuation.

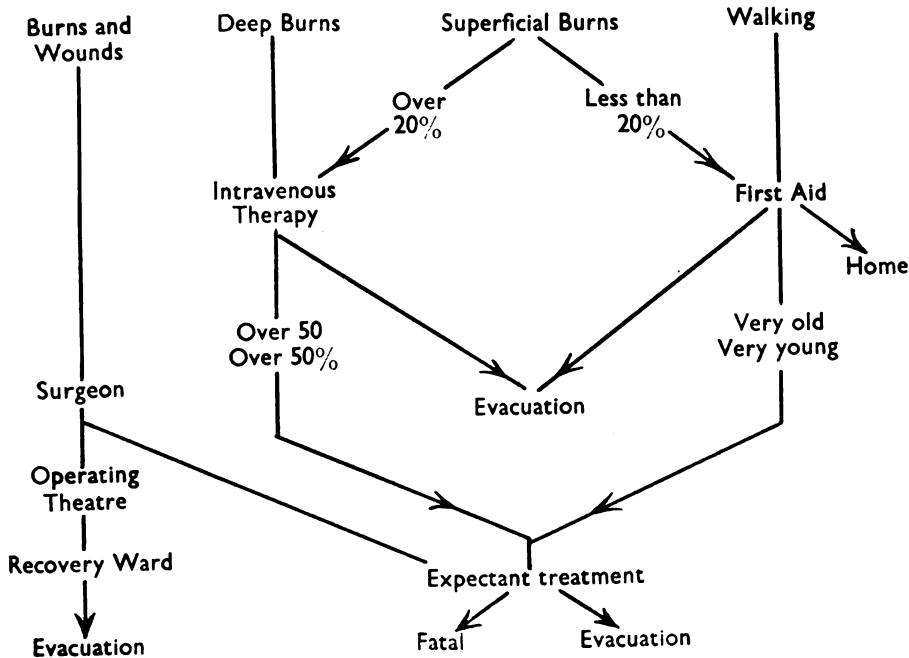
(2) *More extensive superficial burns.* If less than 20 per cent in area many of these may have to be watched and evacuated quickly. The shortage of intravenous fluids may mean that these patients will have to take their fluids by mouth only. If over an area of 20 per cent, early intravenous therapy must be instituted with all supportive measures thought advisable. Very few of these patients will have to be held in the filter unit and not evacuated. This is the category that will repay energetic treatment at an early stage.

(3) *Extensive deep burns.* It seems probable that the group for expectant treatment will be largely drawn from this class of patient, particularly the older patients (over 50) with over 50 per cent burns. It would not be wise to divert too much care and attention to these patients if it means that those in category (2) above will suffer as a result.

(4) *Burns complicated by wounds.* In this category are burns of all kinds with open wounds. It is to be feared that only a very few surgical teams are likely to be found at this level. However, the arrest of hæmorrhage, the splinting of fractures and urgent amputations will have to be performed before evacuation to the base unit. It should be borne in mind that partial thickness burns do well in plaster if this is loosely applied with plenty of padding, but that full thickness burns are better exposed. This may be impossible during transportation under conditions of stress, when dressings should be applied.

The situation at the filter post can be summarised by the accompanying diagram.

On arrival at the base hospital the careful triage of these patients must be organised all over again. At this level it is hoped that a really experienced officer will be available for this purpose, for instance the commanding officer of the burns team. This man again will have to make the most important decision as to which patients are to be diverted to the “expectant” group.



He will receive patients from the filter unit in the order in which they are evacuated and already classified. In many cases he will have to change the classification of these patients. Many of the superficial burns may prove to be deeper than was expected. Some patients who might have "got by" without intravenous therapy will now require it. Some patients originally thought to be fit only for expectant treatment may be thought suitable for more energetic measures.

TREATMENT

General Treatment

Blood is desirable but not absolutely essential during the first five days for the treatment of burns and will probably not be available. It will, however, be essential later and it is stressed that long before the end of the first ten days it will be urgently required for most of the full thickness burns. Plasma or plasma substitutes may be more readily available, but then only in limited quantities. The pathological services will also be fully extended in grouping and cross-matching patients for transfusion, and the actual quantity of fluid to be given by the intravenous route will have to be judged by simple clinical means.

The clinical guides recommended are :

- (a) The presence of cyanosis, restlessness or thirst.
- (b) Increased pulse rate (adults over 120 per minute and children over 150).
- (c) The urinary output (under 500 ml. per day or 30 ml. per hour for adults or half these quantities in children up to seven years).

Where adequate fluids are available, then total dosage may be based on the "rules of nine" (Wallace, 1951) and the ready reckoner. Fluids must be available for drinking by every bedside. Tea should be in plentiful supply or at least plenty of drinking water. Artz & Pittsburly (1956) recommend 3 g. of salt and 1.5 g. of sodium bicarbonate in 1 litre of water by mouth.

Feeding will be difficult even if adequate supplies of food are available, but the situation may be eased with plenty of volunteer help. Cases with burns of the hands and face find feeding extremely difficult and will commonly have to be spoon-fed. The most severe burns will require intubation.

Antibiotics

Many antibiotics given by mouth are either not absorbed or else lead to intestinal upsets, which must not be risked at this stage. If applied locally, penicillin commonly causes reactions due to sensitivity. The ideal antibiotic has yet to be found, but at present the injection of "penidural" is recommended to tide the patient over the first five critical days. In an emergency any antibiotic will be preferable to none.

Local Treatment

If a burn that is suitable for exposure presents itself grossly contaminated—*e.g.*, covered with dust and débris—then there is no need for a special toilet. However, with large open wounds or circumferential burns, if the decision is made to cover with dressings, then the burnt areas covered *must* be cleansed beforehand.

If a patient arrives from the filter unit covered with burns dressings, they should be left alone to avoid making extra work later. The only exceptions to this routine are dressings on the face, hands or perineum which should be replaced by exposure when practicable.

The overwhelming nature of the nursing problem in the treatment of mass casualties suffering from burns must be emphasised. The ward medical officer has a particular responsibility in this connection for the greater number of the nursing personnel available will be relatively untrained.

We have underlined the need for oral and parenteral fluids, for the measurement of urinary output, for the administration of antibiotics and for the possible dressing and redressing of patients with associated lesions. In addition there are many points in the nursing of specific areas which may be considered topographically: the face, the hands, the lower limbs and the perineum.

The face. Hair must be cut well back off the affected area of the forehead or it will stick and become involved in the eschar. The eyelids in the first five days will be so œdematous (unless burnt in full thickness) that the patient may for practical purposes be blind. The eyelids should be kept moist and the eyes carefully wiped clear of mucus. Irrigations are not necessary but albucid drops may be used if available. The nose will be scorched and clogged up with exudate, and must be carefully and painstakingly cleaned with cotton wool and liquid

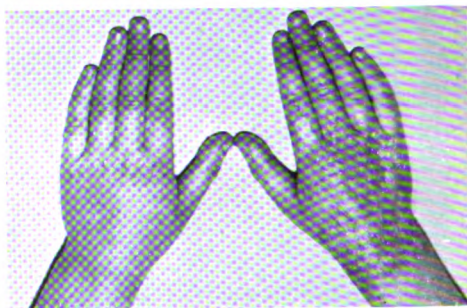


CASE 1.—This patient sustained severe burns of the arms and legs in addition to this facial burn. The only area of full thickness loss on this patient's face was a tiny area on the chin—only experience could have diagnosed this in the early days.



CASE 2.—This patient sustained a burn in full thickness of the right side of her face. Had this been missed or under-estimated the right eye might well have been lost. Extensive grafting procedures were necessary.

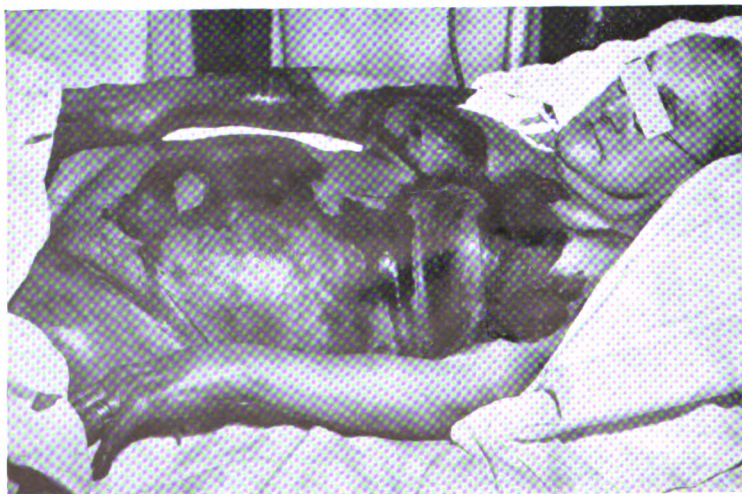
ASSESSMENT OF THE DEPTH OF A BURN



THE WALKING WOUNDED EVACUATED BY STRETCHER

Illustrate the problem of burns of the face and hands in a small girl. The forehead burn is largely full thickness and so is that on the dorsum of the right hand. This child would probably reach the Filter Post with her family on foot, but would have to be evacuated by stretcher.

Treatment was by exposure and grafts were applied on the twenty-first day.



The walking wounded that becomes non-transportable and is treated expectantly with a fatal termination.

This old lady set her clothing on fire in her own home. She took off her clothing, gave herself a hot bath and got into bed. The doctor was sent for and immediately arranged for her transfer to hospital. On arrival she spoke coherently—passed a few cc.s of bloodstained urine and died that night.

This patient in an emergency might well have found her way to the Filter Post unaided, but even with full resuscitation such a burn would eventually prove fatal.

SORTING PROBLEMS

paraffin. The lips will be parched and stiff and should be covered with petroleum jelly.

The hands. Should these be exposed and encouraged to move, or should they be covered and splinted? If the patient is able to move his fingers, exposure is recommended. If œdema and the depth of the burn are such that movement is not possible, then dress in the position of function and suspend the arm above the level of the shoulder. Many patients will have both hands elevated in this way and the nursing problem is made correspondingly more difficult. There may be a great future in the employment of special bags or gloves that are relatively permeable to discharge from within, but which do not allow the ingress of dirt and organisms.

The legs. These should be treated by exposure wherever possible. Care must be taken that no undue pressure is allowed on the back of the heels. If the patient insists on flexing the knees into a more comfortable position, the legs will have to be splinted with a back splint, but this should not occur in the first five days. With the usual amount of œdema elevation must be tried. Some overhead "Balkan" beam may have to be improvised and a sling suspension employed. Watch for extension at the ankle and splint if the power of movement to a right angle is lost.

The perineum. However deep the burn, treat by exposure. If the other lesions permit, nurse on the front with arms and legs spreadeagled. Children must be tied out into this position and they suffer little discomfort. Adults will adopt the position more readily but suffer greater discomfort and should be allowed to move on to their sides if practicable.

GENERAL CONSIDERATIONS

To what extent will it be necessary to segregate the sexes? This particularly applies at filter post level where families will be admitted together. The forcible separation of children from their parents, or of wives from husbands, must inevitably increase alarm and despondency. At this level there may be little adequate documentation and children will very easily get lost. In the presence of radiation risks, admissions will have to be divided up into two main categories by a monitoring service, and this further division by the segregation of the contaminated, is likely to tax the resources of the unit even more. No harm can result from treating men and women together in the filter post and then re-considering the question at base hospital level.

Some discussion always arises when the word "exposure" is mentioned. In the climate of the British Isles, with ambulances as they are today and in improvised buildings without adequate heating, it stands to reason that the severely burnt patient will usually do better if his burns are dressed than if he is exposed to the elements. The walking case also must feel more secure if the burn is dressed, and protected from the friction of rough clothing. Pain is often relieved as soon as a burnt area is covered. The decision to expose a burn should mostly be taken at the main base hospital when evacuation is completed.

Medical officers will be in short supply. It would be a mistake to lay down an exact number of patients per medical officer as a definite establishment. If a figure must be given, I should try to have on duty over twenty-four hours three medical officers for a hundred beds. More medical officers would be preferable, but any decrease in the number would lead to a serious deterioration in the standard of professional care and an immediate reflection of this in an increased mortality and morbidity rate.

SUMMARY AND CONCLUSIONS

The above remarks are intended to underline the serious nature of the problem of the treatment of mass casualties suffering from burns in war. There has been a tendency to underestimate the gravity of the partial thickness burn and the work required to bring these victims through the first five days. The difficulties and importance of adequate treatment of this large group are particularly stressed.

In the treatment of burns the result obtained is commensurate with the amount of care and attention that each patient receives. There is no easy way of obtaining peace-time results in the warfare of the future by merely increasing the burden on the hospital staffs. The results in the patients will be reflected by a parallel increase in the mortality and morbidity rates.

The immediate task before us is to supplement the hospital staff by interesting and training the civilian population in first aid with particular reference to the problem of treating burns. Only in this way can we ensure an adequate pool of trained medical and nursing personnel to assist wherever incidents may arise.

REFERENCES

- ARTZ, CURTIS P., PILLSBURY, ROBERT D. (1956). *J. Amer. med. Ass.*, **162**, 956.
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ERRATUM

In the article on the Field Training Centre on page 169 of the Diamond Jubilee Number, the 1950 D.G.A.M.S. Exercise was mistakenly referred to as "John Bull" instead of by its correct title "Horatius." "Britannia" studied Civil Defence as it affected the United Kingdom and "Horatius" the defence of a river line

THE CHEMOPROPHYLAXIS OF GAS GANGRENE

BY

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It is generally agreed that penicillin contributed substantially to the prevention of gas gangrene in World War II casualties from D Day, 1944, onwards, when systemic administration for this purpose was first regularly practised. At that time no other antibiotic was available. There are now many, including several others with an action on clostridia comparable to that of penicillin. Is any of these now to be preferred to penicillin for this purpose?

Gas gangrene is rare in civilian practice, and an effective comparison of different methods of preventing it would occupy many years, if indeed it could be made at all. Only war provides material for such a study, and it is therefore natural to turn to the war in Korea for possible enlightenment. In fact, experience there, although highly successful in the prevention of this infection, affords little new information about any part which antibiotics can play in this. It is evident from the papers of many authors in Vol. III of the American Army publication *Battle Casualties in Korea* that the evacuation of the wounded on this front, often by helicopter, was exceptionally rapid, and that definitive surgery was carried out after an interval considerably shorter than has been possible in any previous campaign. Adequate and early surgery is much the most important factor in the prevention of gas gangrene, and it is therefore not surprising that this infection was rarely seen. Howard & Inui (1954, 1955) saw only four cases among 4,900 battle casualties during a fifteen-month period; four others were diagnosed at an evacuation hospital among a total of 12,000 casualties. These eight cases are described, and some of them appear to have had ischæmic gangrene rather than true clostridial myositis, if the latter be defined as the invasion of normal muscle from the primary focus. None of them died, six had wounds involving large arteries, (femoral, popliteal, or both anterior and posterior tibial), and in one case "gas gangrene" developed "distal to the tourniquets" on both legs. All casualties were given a moderate dose of penicillin at the battalion aid station. Treatment was continued with penicillin, often with the addition of streptomycin, and sometimes with chlortetracycline. No attempt was made to compare the efficacy of penicillin and chlortetracycline in either prevention or treatment.

PREVIOUS LABORATORY STUDIES

The expectation that antibiotics other than penicillin, and in particular the tetracyclines, may be of value in gas gangrene is based in the first instance on laboratory tests.

In vitro activity. Almost all authors who have studied the action of tetracyclines on clostridia *in vitro* have found them highly active, usually more so

than penicillin, and in most experiments chlortetracycline has been found the most active of the three. Bliss, Warth & Chandler (1950) tested chlortetracycline and oxytetracycline against five species: the former inhibited growth in concentrations five times lower. English, P'an, McBride, Gardocki, van Halsema & Wright (1953-54) in tests with all three tetracyclines against three species also found substantial differences in favour of chlortetracycline. Willich (1952) in tests with three antibiotics against 13 species of clostridia found the order of activity to be oxytetracycline > chlortetracycline > chloramphenicol. Eveland, Newton, Pohutsky, Purdy & Frick (1955) made tests with 103 strains of fourteen species and four antibiotics and found their order of activity to be chlortetracycline > penicillin > oxytetracycline > chloramphenicol. Several papers report tests of strains isolated in Korea. Newton, Strawitz, Lindberg, Howard & Artz (1955) tested 56 strains comprising nine species and found considerable variations in sensitivity to the four antibiotics studied. The range of minimum inhibitory concentrations in $\mu\text{g./ml.}$ was for chlortetracycline 0.0125-0.8, for oxytetracycline 0.05-3.2, for penicillin 1.2-3.8, and for chloramphenicol 1.0-32. They relate these findings to the maximum concentrations of the antibiotics produced in the blood by ordinary doses. On this basis the only antibiotic inhibiting all the strains was chlortetracycline. (In fairness to penicillin it should be observed that the blood levels assumed for this purpose are the comparatively low ones produced by procaine penicillin). The most extensive tests of this kind have been those of Lindberg & Newton (1954-55), who examined 507 strains embracing eighteen species and fifty-nine unidentified organisms, 457 being from wounds in Korea and 50 from soil or clothing. The wound strains were rather less sensitive than the latter group, possibly as the result of antibiotic treatment before material for culture was obtained. Streptomycin was not tested, because of its known inactivity. The order of activity of the four antibiotics tested was chlortetracycline > oxytetracycline > penicillin > chloramphenicol. In a few tests by a simpler method polymyxin was found to be without effect and bacitracin highly active. The findings for 126 of these strains are also reported elsewhere by Lindberg, Wetzler, Marshall, Newton, Strawitz & Howard (1955), whose paper contains the significant sentences: "During the Korean conflict, penicillin was used almost exclusively for the prophylaxis of wound infections. Perhaps the re-evaluation of antibiotic therapy after wounding would lead to the more extensive use of the newer antibiotics."

Tests in vivo. Experimental study of the treatment of gas gangrene is hampered by the fact that the most suitable animal, the guinea-pig, is also the only species to which the administration of penicillin or a tetracycline may itself be fatal. Altmeier, McMurrin & Alt (1950) found both chlortetracycline and chloramphenicol in moderate doses to be as effective as massive doses of penicillin in the prophylaxis of *Clostridium welchii* infection in guinea-pigs. Sandusky, Keeble, Wharton & Taylor (1950) also found these antibiotics effective in *Cl. welchii* infection in guinea-pigs, if administered within a short time of inoculation. Some of the chlortetracycline-treated animals died later, evidently from the toxic action of the drug, and the results given by chloramphenicol were

irregular. Most other workers have used mice. Bliss *et al.* (1950) found penicillin as good as or better than other antibiotics, including chlortetracycline and oxytetracycline, in infection by *Cl. septicum* and *Cl. tetani*. Kiser, Mello, Reichard & Williams (1952) found that the order of merit of penicillin and chlor- and oxytetracycline differed for the five species of clostridia with which they inoculated mice, but chlortetracycline came first against four of them and oxytetracycline against the other (*Cl. novyi*), penicillin always occupying second or third place. The therapeutic tests in mice of Anwar & Turner (1956) were concerned exclusively with infection by *Cl. tetani*. Under the conditions of their experiments the PD₅₀ (in mg.) were oxytetracycline 1.4, penicillin 8.1, chlortetracycline 10.6, erythromycin 11.6, and tetracycline 14.1. (Only one dose of antibiotic was given daily, and since potassium penicillin was used, which the mouse excretes very rapidly, the results afford little indication of what is to be expected from dosage ensuring continuous action. The difference in effect between oxytetracycline and the other tetracyclines is remarkable and not vitiated by any such consideration.) Lennert-Petersen (1954) also found oxytetracycline inferior to chlortetracycline in preventing the development of experimental *Cl. tetani* infection in mice. He compared these with no other antibiotic.

None of these laboratory studies covers the entire field of this rather complex subject. Not all pathogenic species of clostridia are represented in any author's tests (although some of these embrace various species of doubtful importance), and about some of the newer antibiotics there is little or no information. It therefore seemed worth while to perform a fresh series of *in vitro* tests to fill these gaps in knowledge and to reassess the activity of the major antibiotics in a comparison made by a uniform method.

EXPERIMENTAL

Strains of clostridia. For the great majority of these I am much indebted to Dr. S. T. Cowan of the National Collection of Type Cultures. Strains from this source are denoted in the table by their N.C.T.C. number. Two named strains of *Cl. welchii* were originally isolated in this department from cases of gas gangrene. "R220" is a strain of *Cl. tetani* received from Professor W. J. Tulloch in 1927, and "Birmingham" a strain recently received from Dr. M. J. Meynell. "R.F.T." is a stock culture of *Cl. sporogenes* maintained in this department.

Method of Test. Solutions of pure antibiotics in sterile distilled water in a series of twofold dilutions were added in 0.5 ml. volumes to 14 ml. volumes of nutrient agar, pH 7.4, together with 0.5 ml. of horse blood previously lysed with saponin (to give a transparent medium), and thoroughly mixed. Plates so prepared were divided into compartments by cutting narrow ditches (since most of the organisms studied give spreading growth) and each area was inoculated with a 1 mm. loopful of undiluted twenty-four-hour Robertson's meat broth culture. The plates were incubated anaerobically with approximately 5 per cent added CO₂ in McIntosh and Fildes jars and read for the presence or absence of growth after twenty-four hours.

Table 1. Sensitivity of 10 species of clostridia to 16 antibiotics
Minimum Inhibitory Concentrations ($\mu\text{g/ml}$.)

Species	Number or Name	Penicillin	Streptomycin	Chloramphenicol	Chlortetracycline	Oxytetracycline	Tetracycline	Erythromycin	Spiramycin	Oleandomycin	Carbomycin	E129	Novobiocin	Vancomycin	Bacitracin	Polymyxin	Neomycin
<i>Cl. welchii</i>	1265	0.06	> 128	4	0.03	0.12	0.25	2*	64	16*	1*	0.12	32	1	4	> 128	> 128
	8237	0.06	> 128	4	0.03	0.12	0.12	2*	64	16*	1*	0.12	32	1	4	> 128	> 128
	8246	0.12	> 128	4	0.06	0.12	0.12	2*	64	16*	1*	0.12	32	2	2	> 128	> 128
	"Leyton"	0.12	> 128	4	0.06	0.25	0.12	2*	32	16*	1*	0.12	32	1	4	> 128	> 128
	"Neighbour"	0.25	> 128	4	0.12	0.12	0.12	2*	32	16*	1*	0.12	32	1	4	> 128	> 128
<i>Cl. septicum</i>	285	0.03	> 128	2	0.06	0.12	0.12	0.5	16	4	1	0.12	16	2	8	> 128	> 128
	501	0.03	> 128	4	0.06	0.12	0.12	0.5	16	4	1	0.12	16	2	8	> 128	> 128
	504	0.03	> 128	2	0.06	0.12	0.12	0.5	16	4	1	0.12	16	1	8	> 128	> 128
<i>Cl. oedematiens</i>	278	0.015	> 128	2	0.015	0.12	0.12	0.25	8	2	0.12	0.12	32	1	0.5	> 128	> 128
	538	0.007	> 128	2	0.06	0.12	0.12	0.25	4	2	0.12	0.12	32	0.5	0.25	> 128	> 128
	2908	0.007	> 128	2	0.03	0.06	0.06	0.12	8	4	0.12	0.12	64	0.5	0.25	> 128	> 128
<i>Cl. tetani</i>	279	0.007	> 128	2	0.12	0.25	0.25	0.5	8	4	0.12	0.06	16	1	128	> 128	> 128
	9567	0.03	> 128	2	0.12	0.25	0.12	0.5	8	4	0.12	0.12	16	1	> 128	> 128	> 128
	9572	0.015	> 128	4	0.06	0.25	0.06	0.5	8	4	0.25	0.12	16	2	> 128	> 128	> 128
	"R220"	0.015	> 128	2	0.06	0.25	0.03	0.5	8	4	0.12	0.12	16	2	> 128	> 128	> 128
	"Birmingham"	0.3	> 128	2	0.03	0.06	0.03	0.25	8	4	0.25	0.12	16	2	> 128	> 128	> 128
<i>Cl. histolyticum</i>	503	0.03	64	4	0.03	0.03	0.06	2	4	8	0.25	0.25	8	2	128	> 128	> 128
	2915	0.03	128	2	0.06	0.25	0.06	1	4	4	0.25	0.25	8	1	128	> 128	> 128
	7123	0.03	64	4	0.12	0.25	0.25	2	8	4	0.25	0.25	8	2	> 128	> 128	> 128
<i>Cl. sporogenes</i>	532	0.12	> 128	2	0.03	0.06	0.06	1	8	16	0.25	0.25	64	8	> 128	> 128	> 128
	534	0.06	> 128	2	0.06	0.25	0.06	1	16	16	0.5	0.25	64	8	> 128	> 128	> 128
	"R.F.T."	0.12	> 128	2	0.06	0.25	0.06	1	8	16	0.5	0.25	64	8	> 128	> 128	> 128
<i>Cl. bifermittans</i>	1341	0.12	> 128	8	0.06	0.25	0.25	0.12	8	2	0.25	0.25	64	0.5	8	> 128	> 128
	6798	0.25	128	8	0.03	0.06	0.06	0.12*	16	16*	1	0.12	16	2	128	> 128	> 128
<i>Cl. sphenoides</i>	507	2	64	8	0.06	0.12	0.12	0.5	8	8	1	0.25	16	1	> 128	> 128	> 128
<i>Cl. tetanomorphum</i>	288	0.12	> 128	2	0.03	0.12	0.06	0.5	8	1	0.5	0.06	16	4	> 128	> 128	> 128
	500	0.25	> 128	2	0.03	0.06	0.06	1	8	4	0.25	0.12	8	1	> 128	> 128	> 128
<i>Cl. tertium</i>	541	1	128	1	0.03	0.06	0.06	1	16	16	0.5	0.12	8	2	2	> 128	> 128
	2917	1	> 128	4	0.03	0.06	0.06	1	32	16	0.5	0.25	16	4	8	> 128	> 128

* Concentration inhibiting normal growth: See text.

RESULTS

The minimum inhibitory concentrations so determined of 16 antibiotics for the 29 strains of 10 species of clostridia studied are stated in Table 1. All the results were quite clear-cut except for the action of erythromycin, oleandomycin and carbomycin on all strains of *Cl. welchii*. Normal growth was inhibited by the concentration stated, but on medium containing two, or even four, times this amount there was a faint haze of growth consisting microscopically of exceedingly long Gram-positive filaments.

It is at once apparent that streptomycin, neomycin and polymyxin can be excluded from further consideration. The activity of novobiocin is also too low to afford any promise of clinical usefulness. The same may be said of bacitracin, which affords the only example of wide inter-species differences, only one, *Cl. œdematiens*, being highly sensitive to it. In what may be called the erythromycin group, spiramycin and oleandomycin are much less active than erythromycin or even than carbomycin, which is actually more inhibitory to some species than erythromycin itself, a finding in marked contrast to their relative activity against most bacteria. Antibiotic E129 (Garrod & Waterworth, 1956) is uniformly and fairly highly active. The activity of chloramphenicol is strikingly uniform, but at an unpromisingly high concentration level. That of vancomycin is similar, and in view of the present difficulty of administering this antibiotic, its use for this purpose is not in any case likely to be considered. These observations therefore serve to show that none of the newer antibiotics can rival penicillin and the tetracyclines for the prevention of clostridial infection.

The arithmetic means in $\mu\text{g./ml.}$ of the minimum inhibitory concentrations of these four major antibiotics for all 29 organisms, in descending order of activity, are chlortetracycline 0.055, tetracycline 0.106, oxytetracycline 0.147, penicillin 0.215. There is not much strain variation in sensitivity to these antibiotics, nor are most of the interspecies differences wide, although it is noteworthy that penicillin is actually more active than the tetracyclines against some of the more important species (*Cl. septicum*, *Cl. œdematiens* and most strains of *Cl. tetani*), and owes its position in the order of activity to the lesser sensitiveness of relatively unimportant organisms lower in the list. Excluding the aberrant results with two of these species, the arithmetic mean of its inhibitory concentrations becomes 0.088, ranking it second in order of activity.

Tests of combined action. In view of the possibility that penicillin and a tetracycline may be administered together, it is necessary to know how they act in combination. Determinations of minimum inhibitory concentrations were made by the same method, on medium containing a suitable range of concentrations of penicillin and chlortetracycline alone, and containing varying concentrations of each and fixed concentrations of the other (the latter were penicillin, 0.015 and 0.003 $\mu\text{g./ml.}$ and chlortetracycline, 0.03 $\mu\text{g./ml.}$). The organisms so tested were four strains of *Cl. welchii* and three each of *Cl. œdematiens*, *Cl. septicum* and *Cl. tetani*. The results need not be given in full, because they are covered by the statement that when both antibiotics were present in in-

dependently effective concentrations, the result was an additive effect. No suggestion of antagonism was seen.

An attempt was also made to study independent and combined bactericidal action by adding antibiotics singly and in various combinations, in the fixed concentration of 10 $\mu\text{g./ml.}$, to blood broth, inoculating fairly heavily and sub-cultivating on blood agar after overnight anaerobic incubation. The results of this proceeding were irregular and difficult to interpret, probably for three reasons: the difficulty of ensuring that the culture used contained no spores, which would in any case probably not be killed, the impossibility of judging the proportion of survivors of organisms with a spreading habit of growth, and the possibility that a sterile subculture might only exemplify the reluctance of clostridia to grow from a small inoculum.

DISCUSSION

It appears from these results that none of the more recent antibiotics is likely to have any outstanding value for the prevention of clostridial infection. The findings for penicillin and the tetracyclines agree generally with those of previous workers, and it is clear that reliance must be placed on one of these. The question is: does the *in vitro* superiority of chlortetracycline indicate that it should replace penicillin for this purpose?

Any answer to this question can only be an opinion, since there are no adequate therapeutic comparisons, either experimental or clinical, to provide the necessary confirmation. The differences in activity of these four antibiotics are small, and it is likely that any of them given in adequate doses, and in the favourable circumstances of civilian practice, would achieve its object. Which of them is to be preferred for a battle casualty whose evacuation and surgical treatment may be delayed? There is a serious objection to the use of tetracyclines in these circumstances, namely, that absorption of an orally administered drug may be unsatisfactory in a man suffering from shock. Intravenous administration is obviously impracticable in the field. For this reason, and because its worth has been proved, penicillin may still be considered the antibiotic of choice. Casualties in Korea were given 300,000 units (sometimes 600,000) of procaine penicillin. Newton *et al.* (1955) found that not all their Korean strains of clostridia were inhibited by the concentration of penicillin known to be attained in the blood after these doses of this form of penicillin, and it is difficult to understand why the preparation used did not contain some sodium or potassium penicillin to give higher blood levels, or why the dose was not larger. A greater margin of safety would be afforded by an initial dose of say 400,000 units each of potassium and procaine penicillin, repeated at intervals of 6 hours.

SUMMARY

The action of 16 antibiotics on 29 strains of 10 species of clostridia has been studied *in vitro*. None of the newer antibiotics, about which there is little or no previous information, has any outstanding activity.

The arithmetic means of the minimum inhibitory concentrations for all these organisms of the four most active antibiotics were (in $\mu\text{g./ml.}$) chlortetracycline 0.055, tetracycline 0.106, oxytetracycline 0.147, penicillin 0.215; excluding the exceptional results with two species of lesser importance, the mean for penicillin was 0.088.

Reasons are given for the belief that penicillin should be preferred to the tetracyclines for the immediate prophylaxis of gas gangrene in battle casualties.

I am indebted to Major-General J. Huston, Director of Surgery, for interesting me in this problem in my capacity as Consultant in Antibiotics to the Army, to several members of the staff of the Walter Reed Army Hospital, Washington, for a helpful personal discussion, and to my assistant, Miss Pamela M. Waterworth, for her skilful execution of the tests described in this paper.

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LUNG RESECTION FOR TUBERCULOSIS IN THE ARMY

A REPORT ON 61 CASES

BY

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LUNG resection in pulmonary tuberculosis has been carried out at the Connaught Hospital (Army Chest Centre) since October, 1953, and a general account of chest surgery in Army patients has already been published (Mackay-Dick & Large, 1957). Up to 31st December, 1957, a total of 322 resections in 318 patients had been performed and a preliminary report on the first 125 of these has also appeared (Large, Curry & Harrison, 1957). Of the 318 patients so far operated on, 61 have been retained in the Army and followed up at the Army Chest Centre and this report deals with the details of the operative procedures and the results of follow up. All the patients were male British other ranks serving on regular engagements, most of whom were senior N.C.Os. or warrant officers (officers are transferred to King Edward VII Sanatorium, Midhurst, for treatment). Their average age was 30.3 years. The oldest was 47 and the youngest 20 years of age. Three of the patients had bilateral resections, so the report deals with 64 resections (34 on the right : 30 on the left) in 61 patients.

Type of disease

We admitted a relatively large number of patients with early active pulmonary tuberculosis and it is from these that most of the patients for operation came. On the other hand advanced chronic pulmonary tuberculosis is not often seen at the Connaught Hospital and those cases admitted were usually transferred quickly to civilian sanatoria.

Table 1 shows the type of disease for which resections were done.

All cases had a negative sputum by the time they were operated on. 26 had had a positive sputum at some time before operation : 35 had negative sputa throughout.

Table 1. *Type of disease operated on.*

<i>Disease</i>	<i>Number</i>	<i>Percentage</i>
1. Solid lesions which changed little or not at all on chemotherapy ...	9	14%
2. Residual disease after bed rest and chemotherapy had resulted in radiological clearing and/or cavity closure before operation		
(a) Non-cavitated at operation	45	70.4%
(b) Cavitated at operation	10	15.6%
Total	64	100%

Indications for resection

Cases for resection can be divided into two main groups: those in whom the disease remains active in spite of bed rest, drugs and relaxation measures, and those in whom the disease has already been stabilised by these means. The majority of our cases belonged to the second group. Surgery was undertaken because it was considered that the removal of the diseased area offered the best safeguard against subsequent breakdown of the disease. We regarded resection as the treatment of choice except in those with disease too extensive to permit its removal or those with so little radiological evidence of disease remaining after medical treatment that it was felt justifiable to leave them.

In the majority of our patients, all disease which was palpable at operation, or radiologically visible before operation, was removed. Recently, however, growing knowledge of the effects of long periods of chemotherapy has caused us to modify our procedure in certain cases and we have felt it reasonable to operate on more extensive cases by removing only the main areas of disease and leaving behind lesser areas which we felt could be left under chemotherapeutic control. Furthermore we have felt justified in adopting conservative measures in many patients with limited areas of disease which previously would have been removed.

Pre-operative treatment

Resection in all our cases was preceded by a course of medical treatment (rest, drugs and sometimes pneumoperitoneum) the length of which varied according to the type of disease and its response to treatment. Normally, resection was undertaken when it was judged that no further improvement of the disease by non-surgical means would occur. This took anything from a few weeks in patients with small solid lesions to many months in patients with more extensive disease. The average time in our series was five months. For some weeks before operation, patients were taught breathing exercises and postural drainage, which were continued after operation under the direction of the physiotherapist.

Table 2. *Extent of lung removed at operation.*

<i>Operation and amount of lung removed</i>	<i>Number</i>	<i>Percentage</i>
Wedge resections	4	6.2%
Segmental resections:		
One segment	9	14%
Two segments	38	59.6%
Three segments	4	6.2%
Lobectomy:		
One lobe (the left upper lobe includes the lingula)	7	10.9%
Lobe and one segment	2	3.1%
Total	64	100%

Operative and post-operative management

Table 2 indicates the extent of lung removed by the different types of operation.

Excision of lung tissue was performed by standard technique after freeing the lung of adhesions and applying a bronchial clamp. Raw areas of lung after partial resections were oversewn. In a few of the early cases a space-reducing phrenic crush was carried out when more than one segment had been removed: thereafter this was not done.

Apical and basal drainage tubes were usually left in for 48 hours but if there was persistent air leakage they were left *in situ* for 72 hours. As soon as the tubes were removed the patients were encouraged to get up for toilet purposes and to sit in an arm-chair for an hour a day, but otherwise bed rest was continued for four weeks after operation.

Breathing exercises were started the morning following operation together with postural drainage and shoulder movements.

Four weeks after operation (six weeks for the first 10 patients) we allowed patients up for an hour a day and we increased this by an hour every ten days unless there had been significant complications. When they were up seven to eight hours a day (that is, about 13 weeks after operation) they were discharged on eight weeks' convalescent leave.

Complications

The complication rate was small and most of the complications were minor in nature, causing neither delay in the patients' upgrading nor major upset in their well-being. In only three cases was it necessary to delay the patient's upgrading and date of discharge from hospital and in those cases the added duration of stay in hospital was one, five and ten weeks. We found that the complication rate was significantly less in the later part of the series.

Table 3 shows the incidence of post-operative complications.

Table 3. *Post-operative complications.*

Complication	Number	Percentage
Effusions	2	3.0%
Atelectasis	1	1.5%
Air pockets	3	4.5%
Bronchopleural fistula	1	1.5%
Empyemata	1	1.5%
Pulmonary embolism	1	1.5%
Localised wound infections	1	1.5%
Total complications	10	15.0%

Effusions (two cases). Small basal effusions were not uncommon after the removal of the drainage tubes. Most absorbed spontaneously in the course of a few days but two required aspiration. These were heavily bloodstained and were due to continued oozing inside the chest following removal of the tubes.

Atelectasis (one case). Minimal patchy basal atelectasis, usually on the contralateral side, was a common experience in the first few days post-operatively, but collapse of such magnitude as to be regarded as a complication was un-

common, occurring in only one case. This re-expanded within a few days with intensive physiotherapy and postural drainage. Bronchoscopy was not required.

Air pockets (three cases). We have employed a conservative policy throughout the series with regard to post-operative air pockets and it is, in our experience, exceptional for them to persist beyond three months from the date of operation.

In three cases, however, because of either symptoms or the failure of the pocket to start diminishing in size, intervention was thought advisable, and suction via an intercostal catheter or a Foster Carter needle (depending mainly on whether the air pocket contained fluid or not) was applied with good results. The differentiation of simple air pockets from those with fistulæ was often difficult. Unless there was clear evidence of fistula formation, such as fever and hæmoptysis, we have regarded them as simple air pockets.

Bronchopleural fistula (one case). This showed itself as a persistence of the normal air escape from the drainage tubes beyond the usual time with the development of a large air pocket following their removal. It responded to suction via an intercostal catheter.

Empyema (one case). This was due to *Staphylococcus pyogenes* and was successfully treated by rib resection and drainage.

Pulmonary embolism (one case). This caused pleuritic pain and a small effusion which absorbed spontaneously and caused no delay in upgrading.

Post-operative chemotherapy

During the first half of the period covered by this report chemotherapy was continued up to the time of the patient's discharge from hospital. Since then it has been our practice to continue drugs by mouth (I.N.A.H. and P.A.S.) for at least a year after return to duty.

The follow up

When patients left hospital they were sent on eight weeks' convalescent leave before returning to light duty in category P.7, as described in the War Office publication on the Pulheems system of medical classification (1951). Thereafter they normally attended the Army Chest Centre every three months for review and it has therefore been possible to supervise their activities after operation very thoroughly.

Table 4 shows how long cases have been followed up since operation and how long they have been back at duty.

Table 4. *Length of time since operation and length of time back at duty.*

<i>Time in years</i>	<i>Number of patients followed up since operation</i>	<i>Number of patients back at duty</i>
More than 4	2	—
More than 3	11	8
More than 2	15	11
More than 1	19	18
Less than 1	14	24
Total	61	61

The policy for Army patients has been to keep them at least one year in category P.7 and at least a further year in category P.6 before upgrading them to P.3. This rate of upgrading has not normally been exceeded, but it has been slowed down in those patients who have had significant disease left behind at operation. It is intended eventually to upgrade patients to category P.2 when they have been back at duty for a period of five years. No Army patient has yet achieved this. Table 5 shows the distribution of Army patients by categories on 1st January, 1958.

Table 5. *Distribution of categories on 1st January, 1958.*

<i>Pulheems grading</i>					<i>Number of patients</i>	
					<i>O.Rs.</i>	<i>Officers</i>
P.3	...	...	...	...	12	15
P.6	...	...	...	...	17	6
P.7	...	...	...	...	32	9
Total					61	30

(The corresponding figures for officers are included for comparison)

None of the Army patients followed up at the Army Chest Centre has shown any clinical or radiological sign of spread or reactivation of disease. Only one has shown any disabling symptom directly attributable to the operation. He had a bilateral resection and complained of a moderate amount of dyspnoea on effort since operation.

DISCUSSION

Most of our patients had disease which had already been arrested and rendered stable by rest and chemotherapy but which could not be regarded as healed without many more years of observation. The object of resection in these cases was to prevent future breakdown of the disease: the operation was a prophylactic as well as a curative procedure. Four and a half years have elapsed since resectional surgery was started at the Army Chest Centre and it is timely, therefore, to ask if the procedure has been justified by its results.

First, has resection reduced the incidence of subsequent breakdown and reactivation of disease in those patients who have been retained in the Army? None has so far broken down. The follow-up period has not been long enough to ascertain that resection is a permanent cure, but the results to date are certainly encouraging. The results of large series of civilian cases (some having been followed up for five years or more) show that the subsequent breakdown rate is very small. It is impossible to say how many of our cases would have broken down if they had not been treated by resection, but clinical experience of the natural history of the disease suggests a not inconsiderable number. Todd, Teare & Gordon (1956) showed that even after several months of chemotherapy tubercle bacilli could still be cultured from a large proportion of solid lesions removed at operation and that, as it was impossible to show clinically

or radiologically which were sterile and which were not, their removal by surgery was logical provided the operation could be done safely and quickly.

More recently, however, it has been suggested that chemotherapy can sterilise solid lesions and cavities provided that the drugs are given for long enough (Stewart, Turnbull & Macgregor, 1956) and a recent clinical series showed that of 63 patients with sensitive organisms who received more than 18 months' chemotherapy, none relapsed (Ross, Horne, Grant & Crofton, 1958). It may be that as we learn more about the effects of such long courses of drugs fewer patients will have resections and more will be left under chemotherapeutic control: advancing knowledge in this field has certainly altered our criteria for selection of cases for surgery over the last 12 to 18 months. In the meantime, however, we feel that resection in these patients, the majority having begun treatment at a time when short courses of chemotherapy were the rule, has been justified by the results achieved.

Secondly, has resection affected the Army patient's subsequent Service career? Until a few years ago most Army patients who had tuberculosis were invalided from the Army because there was a danger of the disease breaking down after medical treatment as soon as they were subjected to the stresses of Service life. The exceptional cases who were retained in the Army were kept in low medical categories for many years, and very few of them ever rose higher than the equivalent of category P.7. Since resectional surgery started for Army patients, not only have many been retained in the Army, but they have been returned to higher medical categories more quickly than was possible after medical treatment alone. Our routine of upgrading has been such that soldiers have been returned to light duties in category P.7 five months after operation. Two years later, many cases have been upgraded to P.3, at which level their promotion and career prospects are not adversely affected as they are fit for all ordinary duties. At present they must remain in this category for another three years, but as our knowledge of the end results of surgery is widened by the experience of large numbers of cases, it is probable that this time will be reduced in the future.

Against these advantages must be weighed the risks which are inherent in any operative procedure. First, what is the operative mortality? Most large series of resections for all types of tuberculosis show that the operative mortality is between 1 and 2 per cent (Bickford, Edwards, Esplen, Gifford, Thomas & Waddington, 1957; Thompson, Savage & Rosser, 1954). The deaths, however, have usually occurred in advanced tuberculosis of a type which would not have been considered for retention in the Army. In a series of 238 cases similar to those described in this paper, Todd *et al.* (1956) showed no operative deaths. It can be said, therefore, that the mortality risk is very small, and as experience grows it is likely to become even smaller.

Secondly, what are the risks of complications? The operative complications have been shown in our series to be small and only three patients have had their date of discharge from hospital delayed because of them. Post-operative dyspnoea can sometimes be a serious complication if much lung is removed, but

only one of our patients has suffered from this and he has not been unduly disabled in spite of having had a bilateral resection.

On balance, we believe that the advantages of freedom from risk of breakdown of the disease, and in addition the rapid return to full activity, outweigh the operative risks. We consider, therefore, that resection has been justified by the results in 61 patients studied in this report.

SUMMARY

The operative details and follow-up results are given of 61 soldiers who, since October, 1953, have had resection for pulmonary tuberculosis and who have subsequently returned to duty in the Army.

The operative risks were small.

No case in this series has so far shown subsequent breakdown or reactivation of tuberculous disease.

At 31st December, 1957, 12 patients were in category P.3, 17 in category P.6 and the remainder still in category P.7. They have achieved these categories more quickly than they would have done after medical treatment alone.

It is considered that resection in these patients has been justified by the results achieved.

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CONSTRUCTION OF A MASS MINIATURE RADIOGRAPHY VEHICLE

BY

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IN October, 1955, information was received to the effect that a Mass Miniature Radiographic set was about to be shipped to Singapore from the United Kingdom and that a vehicle would be required to house it ; the vehicle was to be selected from local stocks and modified to requirements.

This information came not a moment too soon as the existing M.M.R. vehicle, which this was due to replace, was on its last legs, having done yeoman service for about five years and covered an enormous mileage.

A Board of officers was duly convened consisting of a representative from R.E.M.E., Ordnance and Command Secretariat, with myself as Chairman, for the purpose of drawing up specifications for the modification of an existing theatre type of vehicle to house a tropicalised M.M.R. set.

Hitherto it had been the practice in the Army for a M.M.R. set to be unloaded on its arrival at its destination and be set up at some convenient hut or room where radiography was to take place ; the generator vehicle would draw up alongside to supply the power, except where the local mains supply was of adequate amperage. On completion of its programme the set would be reloaded on to its vehicle. This frequent man-handling of the heavy and cumbersome components up and down a ramp, without the assistance of a crane, not infrequently led to the delicate mechanism being put out of adjustment, so that programmes were upset, radiographic results were unsatisfactory and frequent calls were made on R.E.M.E.

This seemed a suitable opportunity therefore for modifying a vehicle in such a way that the X-ray set would not have to be removed from the vehicle during radiography, and thus it was hoped to improve the efficiency of the M.M.R. service.

The Board, having assembled, proceeded to a large Ordnance Vehicle Park, where it inspected a huge array of vehicles ranging up to ten tons in size ; after an exhaustive search the Board reached the conclusion that no suitable vehicle existed, and retired to Singapore to think again. The next day it was suggested by a R.E.M.E. officer that the best course might be to build a body of the required dimensions on a chassis of a Bedford Scammell semi-trailer 6-ton cargo vehicle. This idea was approved and a detailed plan was prepared giving the required layout of the radiography room and darkroom and their equipment.

The task of construction was allocated to 40 Base Workshops, R.E.M.E., in Singapore ; the chassis was taken to pieces and construction started anew ;

sheet steel was used in the building of the body of the trailer, which was completed in five and a half months.

The trailer, which is of fairly large dimensions, is coupled to a prime mover, thus making it an articulated vehicle ; it is not the intention that the prime mover be uncoupled from the trailer, but should this become necessary two small supporting wheels are let down in front which, together with two built-in jacks used on blocks, give it good stability during radiography.

The trailer is divided into a radiography room behind and a darkroom in front separated by a lead-lined partition and sliding door which exclude light and radiation from entering the latter.

Measurements of trailer

			<i>Height</i>	<i>Length</i>	<i>Width</i>
Overall	...	...	11 ft. 6 in.	19 ft. 1 in.	8 ft. 6 in.
Radiography room	...	...	7 ft. 11 in.	12 ft.	8 ft. 2 in.
Darkroom	...	...	6 ft. 6 in.	6 ft. 7 in.	8 ft. 2 in.

Radiography room

The X-ray set is mounted with its tube facing the rear. A patient enters by a side door, steps into position as directed by the positioner, is radiographed and leaves by the opposite side door in a matter of seconds. Enough floor space was provided to enable the set to be used in the 60-inch position as is required when large films are taken. It was thought that the N.C.O. radiographer, on scanning the processed film strip, would be able to pick out the more obviously abnormal films, take large films where necessary before leaving the unit, and so save time and some additional work for hospital X-ray departments.

The control table and its mounted protective screen are set at an angle which is adjustable by altering the bolt-hole positions in the floor to enable the optimum position to be attained in the protection of the radiographer ; a second screen is provided for the positioner, who after positioning the patient retires hastily behind it.

Large doors are mounted at the rear to enable the equipment or heavy components to be removed should a major workshops overhaul become necessary. A specially designed wooden desk is provided for use by the clerk outside the vehicle. This is stowed in front of the rear doors, and beneath this is housed the X-ray tube in its sprung cradle within its box, all secured by web strapping. The positioner's screen is stowed against a side wall mounted on sorbo rubber cushions. The bases of the transformer and camera stand are clamped to the floor and remain rigid during transit ; the camera is removed and stowed in its box in a cupboard in the darkroom. Electric fans are supplied to ensure air movement. A cupboard for holding record cards is fixed to the wall to enable the positioner to deposit them during radiography. A number of lockers are fitted mainly for the storage of personal belongings of the staff. A bench type padded seat is provided for use of the individual travelling in the trailer.

Darkroom

This is air conditioned by a 3/4 h.p. unit salvaged from the old M.M.R. vehicle. There is plenty of room for the radiographer to process his films without feeling cramped. A loading bench is provided on each side ; under one which is hinged is located a set of 15-inch by 12-inch processing tanks for handling large films ; in addition, a sink, viewing box, cupboards, typewriter, 35 mm. processing equipment, hangers, cassettes, safelights and other apparatus are supplied.

Water is pumped from a large tank below to a smaller one above by means of a hand pump ; it is then fed by pipe to the sink ; a rubber hose can be connected to the tap when it is required to fill up the large processing tanks. A 35-foot rubber hose is provided to enable the large tank to be filled from a convenient water source.

The film cupboard is lead lined to prevent any chance of the films being fogged by radiation in the event of the sliding door being left open during exposure. No drying apparatus was considered necessary as 35 mm. film, being very thin, dries fairly quickly.

Electric power

A three-ton lorry mounting a 15 KVA, 230 volt a.c. diesel generator provides the power for operating the set, normal lighting, air conditioning plant, and for charging the trailer's battery through the battery charging apparatus mounted beneath the vehicle. The battery supplies emergency lighting and power for the fans and safelights. The generator is connected to the trailer by a 20-yard heavy duty cable.

Staff

The M.M.R. team comprises a sergeant radiographer, two general duty men and two drivers ; one of the two general duty men acts as a clerk and the other as a positioner. Although this staff is well below the authorised establishment of an M.M.R. team, it functions smoothly ; there is difficulty in ensuring regular leave, however, especially for the radiographer.

General

During construction, a great many difficulties were overcome. For instance, the darkroom layout had to be redesigned completely because the air conditioning unit would not fit satisfactorily in its originally planned location. When the prime mover was received it was found that its petrol tank only held about 15 gallons, so it was decided to increase the vehicle's range to about 240 miles by fitting holders for jerricans ; these were welded to the chassis.

There was considerable doubt as to whether the brakes would be adequate to hold the vehicle, as none, other than parking brakes, were fitted to the two road wheels of the trailer ; the only available road brakes operated on the four road wheels of the prime mover. It was decided after several hill tests to allow the vehicle to function for several weeks and to recall it for examination after some

working experience had been gained by the team ; the brakes, door locks, jacks and floor covering were then reported faulty and duly rectified.

As no form of warning device had been installed in the trailer to enable a passenger on finding some fault developing—such as loose equipment—to warn the driver, a push button and warning horn were installed.

From reports received, the vehicle has functioned well and in accordance with expectations. Perhaps the best index of its worth is the number of cases handled : in its first five full working months up to the end of December, 1956, it has handled an average of 3,238 cases per month, a most satisfactory figure considering the long distances involved. Interpretation of these films is carried out by the radiologist at the B.M.H., Kinrara.

It is hoped that construction of a second M.M.R. vehicle of similar design, for which the X-ray set is already available, will start soon.

Much credit is due to Captain J. Hardie, R.E.M.E., who was in general charge of construction of the trailer ; to Staff-Sergeant J. Greaves, R.E.M.E., who with his Chinese technicians actually built it ; and to Lieut.-Colonel G. A. Marsh, R.E.M.E., who as officer in charge of Workshops was largely responsible for the technical design and who first suggested the type of chassis to be used.

TREATMENT OF CRUSH INJURY OF THE CHEST BY INTERMITTENT POSITIVE PRESSURE RESPIRATION AND CONTINUOUS CURARISATION

BY

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THE method of treatment of crush injury of the chest is dependent to a large degree on the type and severity of the injury. Treatment may range from strapping, rest and analgesics in the milder cases to skeletal traction and plaster in the more severe. Hagen (1945) and Brooks (1942) have used mechanical respirators with considerable success. Gray (1942) and Watson-Jones (1955) also advise their use. Recently, Hulman (1957) summarised the rationale of tracheotomy described by various authors in the past : Carter & Giuseffi (1951, 1953, 1954), Von Leden (1953), Gray (1954), Williams (1951, 1955), Baronofsky, Dickman & Vanderhoof (1950), Avery *et al.* (1955, 1956) have described treatment with continuous hyperventilation and intermittent positive pressure.

This paper is the record of a failure, but the patient, moribund on admission with a "stove-in" chest, was kept alive for six days, so it is felt that a description of the methods used, mistakes made, and lessons learnt is worth reporting.

CASE REPORT

The patient, a well-built young soldier of 22 years, was admitted to the British Military Hospital, Nicosia, having sustained a severe crush injury to his chest following a road accident in February, 1956. He was seen on admission (half an hour after the accident).

Condition on admission. The patient was severely shocked with an unrecordable blood-pressure. Examination of the chest revealed a severe "stove-in" injury and a fractured right clavicle with considerable hæmatoma formation around the right shoulder. Clinically there was evidence of a right hæmopneumothorax of considerable size. Respiration was paradoxical, every inspiratory movement causing insucking of the chest and considerable respiratory embarrassment. There was marked pallor, followed by cyanosis as the blood pressure became elevated. There was no clinical evidence of head, central nervous system or abdominal injury. Bowel sounds were present and remained so until he died. The skin surface was intact.

TREATMENT

The patient's blood was immediately grouped and a dextran drip set up. Oxygen was administered by an oro-nasal B.L.B. mask with no relief of cyanosis or respiratory embarrassment. After consultation, it was decided that the only possible way of saving this patient was to inflate his lungs by intermittent positive pressure. Accordingly, after the administration of atropine sulphate gr. 1/100 intravenously, a small dose of thiopentone sodium (2 ml. of a 2.5 per cent solution with the addition of 2 ml. Nikethamide to 10 ml.) was given, followed by 20 mg. of "Tubarine" intravenously. The vocal cords were sprayed with 5 per cent cocaine, the patient inflated with 100 per cent oxygen and a No. 10 cuffed Magill tube passed under direct vision. Blood and mucus were present in the trachea in great quantity and this was sucked clear with a gum elastic catheter. His condition at the time did not justify the strain of bronchoscopy. 100 per cent oxygen was then administered by positive pressure on the rebreathing bag of a standard Boyle's machine. As a result of this procedure there was a marked improvement in the patient's general condition and resuscitation was continued with the administration of blood.

Radiography of the chest by portable apparatus confirmed the clinical finding of hæmopneumothorax on the right side and the presence of fractured right clavicle, fracture of the first to eighth ribs at their angles on both sides, and scattered fractures at other sites on the ribs.

An intercostal thoracotomy was therefore performed under local anæsthesia. This resulted in the immediate withdrawal of three pints of blood under pressure and considerable quantities of air. There was a further marked improvement as a result of this procedure. A needle passed into the left chest resulted in a dry tap.

In view of the improvement so far gained it was decided to continue inter-

mittent positive pressure and the endotracheal tube was connected up to a Radcliffe positive pressure machine. Further surgical treatment was postponed at this time, thoracotomy not being considered advisable.

Six hours later, his clinical improvement allowed him to be respired with air and added oxygen (70 per cent approximately). The total amount of intravenous fluids given at this stage was eight pints of blood and six pints of dextran. It was of interest to note that on admission a dextran drip had been set up in the right arm, and fluid draining from the thoracotomy was like pure dextran, which led one to suppose the right subclavian vein might have ruptured into the right pleural cavity.

The first difficulty encountered was when the effect of the curare had worn off and the patient attempted to breathe. Paradoxical respiration again developed and the patient attempted to "resist" the machine, with the result that he became distressed and much blood was poured into the tracheobronchial tree.

It was therefore decided to keep the patient curarised until such time as the chest became more stabilised (possibly 14-21 days). A rigid routine was therefore adopted. Any attempt at voluntary respiration was countered by the administration of curare. A total of 900 mg. was given in divided doses intravenously over a period of five days.

Tracheotomy was performed twenty-four hours after admission and a shortened endotracheal tube (cuffed) was passed through the opening and artificial respiration maintained by this route. Bronchoscopy was done after the first forty hours and again twenty-four hours later, and on each occasion much blood and blood-stained mucus were aspirated. The trachea was sucked out every half-hour by means of a gum elastic catheter passed down the endotracheal tube. Thirty-six hours after admission, shock had been controlled by the administration of a total of twelve pints of blood and the blood pressure stabilised at 120/80. Urinary output had returned to a reasonable figure (there was a fear at one stage of the patient developing anuria) and the patient was fully conscious, being able to understand a cable from home. It was also found that it was possible to wean the patient of added oxygen, but at no time, except on the day of his death, was it possible to respire the patient on air alone without the onset of cyanosis.

In view of the extensive injury to the chest it was thought inadvisable to move the patient more than was necessary for the treatment of pressure areas, and therefore a procedure was adopted in which the bed was tilted in four directions by insertion of blocks under the legs. The bed was moved every hour. Intravenous drip was discontinued after thirty-six hours (a total of twelve pints blood and six pints dextran having been given) and nourishment and electrolytes were given by intragastric drip. For the first forty-eight hours the patient was catheterised every twelve hours if required and after this he was able to pass urine into a bottle. The cuff on the endotracheal tube was let down every hour. Penicillin (200,000 units six-hourly) and streptomycin (1g. twice daily) were administered. The patient's hæmoglobin was maintained as high as possible by the administration of blood, and the blood chemistry was checked daily (Table 1).

Table 1. *The blood chemistry*

	Blood Urea mg. %	Blood Cl ⁻ mEq/l	Hb%	CO ² vols %	Urine Cl ⁻ g/l
1st Day ...	116	98	80	48	2
2nd Day ...	70	90	70	52	3
3rd Day ...	75	98	72	48	5
4th Day ...	70	88	90	82	3

As it was likely that the patient would naturally suffer much pain and discomfort from the whole proceedings, he was kept heavily morphinised for the first forty-eight hours. Thereafter he was semi-conscious and it was impossible to keep him oxygenated without adding oxygen to the inspired air, and it was felt that the coma was possibly due to carbon dioxide poisoning resulting from the persistently high percentage of oxygen. Furthermore, attacks of elevation of the blood pressure and sweating occurred from time to time. This was undoubtedly attributable to carbon dioxide retention. They were not, however, reversed by increasing the respiratory rate and tidal exchange of the machine. Of further interest was the fact that increasing dosage of curare was necessary to achieve the desired effect.

On the day of death (14-2-56) the effects of curare were reversed by administering prostigmin and an attempt made to let him breathe on his own. This led to severe respiratory embarrassment and it was therefore decided to curarise him again. The patient died quite suddenly and unexpectedly fourteen hours after this procedure, there being no obvious immediate cause of death. His colour was good and the blood pressure was 120/60 two minutes before death, the pulse suddenly rising from 90 to 130.

POST-MORTEM REPORT

Respiratory System. On the left side of the chest there were fractures of the first rib one inch from the sternum and of the second to eighth ribs at their angles. On the right side of the chest the first rib was fractured three inches from the sternum, and the second to seventh ribs were fractured at the angles. The right side of the chest contained about one pint of blood and air and the left side about two pints of blood. There was a tracheostomy sinus leading into the trachea through the fifth, sixth and seventh tracheal rings. There was œdema of the glottis, and ulceration of the larynx on either side, just under the vocal cords. There was congestion of the trachea which was full of thick tenacious blood-stained mucus. The only air-containing tissue in the lungs was that of the anterior segments of the left upper and the right middle lobes. All the other pulmonary tissue was consolidated and very œdematous. There was a penetrating wound two inches deep in the posterior border of the right upper lobe overlying the fracture of the fifth rib at its angle. The whole of the upper lobe surrounding this injury was replaced by blood clot.

Alimentary System. The peritoneal cavity contained about two pints of blood. There was a tear on the superior surface of the spleen, one inch long, surmounted by blood clot.

- Cause of Death :*
- (1) Consolidation of lungs.
 - (2) Bilateral hæmothoraces.
 - (3) Fracture of ribs.
 - (4) Rupture of spleen.

DISCUSSION

It would be impossible to treat such a case in time of war except under special circumstances as there would be neither the facilities nor the time. In this particular case, the extent of this patient's injuries were so severe that recovery was unlikely from the outset.

It was essential to keep the patient well curarised as any effort on the part of the patient to breathe produced embarrassment of respiration and paradoxical breathing. Hyperventilation rather than curarisation has been used by Avery *et al.* (1955, 1956). They observed no demonstrable changes in the blood chemistry, although these are likely to occur with hyperventilation. A large percentage of oxygen was required in this case, because of the diminished area of lung tissue on account of consolidation and collapse.

In retrospect, it would appear that an opportunity to attempt mechanical fixation of the ribs was missed on the second day after admission, when the patient's condition reached its optimum. At the time he was not considered fit for surgery, and his improvement had been so dramatic that further improvement was expected. There is no doubt that considerable lung damage occurred due to constant friction of the lung tissue against fragments of rib.

An interesting point to note is that the ruptured spleen was symptomless and undiagnosed in the presence of more severe thoracic injuries. This masking of signs appears to be quite common in severe crush injury to the chest complicated by intra-abdominal injury.

Hulman (1957) has stressed the advantages of tracheotomy in these cases, which he gives as follows :

- (a) Tracheo-bronchial toilet is more easily carried out.
- (b) Reduction in dead space.
- (c) Resistance of upper air passages is removed.
- (d) Oxygen consumption is decreased on account of reduced muscular activity. Patients with severe crush injury very often use their accessory muscles of respiration. Reduction of dead space and removal of the resistance of the upper air passages will often tide them over a critical stage.

Severe crush injury to the chest carries a heavy mortality. Death appears to be due to :

- (a) Severe embarrassment of respiration.
- (b) Other complicating factors, *e.g.* ruptured spleen and fat embolism.

This patient had both—a less severe case would have perhaps stood a better chance of survival. Results from America (Avery *et al.*, 1955, 1956) with hyperventilation are encouraging.

Tracheotomy, curarisation and intermittent positive pressure enable adequate control of tracheo-bronchial secretions, adequate oxygenation and abolition of paradoxical respiration. If the patient becomes adequately stabilised and recovers from the initial shock, respiratory control will allow other surgical procedures to be carried out, *e.g.*, splenectomy.

SUMMARY

A case of severe crush injury to the chest treated by tracheotomy, curarisation and positive pressure respiration using an endotracheal tube inserted through the tracheostome is described.

A plea is made for its further use in a condition which carries a heavy mortality.

I am indebted to Lieut.-Colonel J. C. Watts, M.C., F.R.C.S., R.A.M.C., under whose care this case was admitted, for his help and advice, and to Captain J. L. Turk, R.A.M.C., for the autopsy report.

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THE INVESTIGATION OF INFLUENZA IN THE ARMY IN 1957

BY

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THE Virus Laboratory of the Royal Army Medical College investigated outbreaks of influenza throughout 1957. Those occurring during the early part of the year were due to the Dutch (1956) strain of virus A, and involved units in Eastern and Western Commands and Germany. The greatest number of specimens came from London District. The attack rate appears to have been generally below 10 per cent and many units escaped the infection. In April there was an outbreak in Hong Kong due to the Asian (1957) strain of virus A. This virus appeared in China in February, spread rapidly through the Far East, and by the end of the year had visited every continent. During July cases were landed in England from outbreaks on board troopships coming from the Far and Middle East. It might have been expected that the disease would be spread from these ships, but influenza did not occur in Army units until the following month. A unit in Western Command, far from ports and with no known connection with other cases, suffered a sharp outbreak. The disease spread rapidly through the Home Commands and Germany, reaching its climax in September. Few units escaped infection and the average attack rate was in the region of 20 per cent. The only outbreak due to influenza virus B during 1957 occurred in an apprentices' unit in Northern Command in May. No cases due to influenza virus C were seen.

COLLECTION AND TRANSMISSION OF SPECIMENS

It was suggested that material for virus isolation should be obtained during the first three days of the disease from six to twelve of the first cases in each outbreak, and that paired sera should be taken from these cases and from as many others as was desired.

Throat swabs or garglings were used for virus isolation. Throat swabs were taken on wooden mounts and broken off into quarter-ounce bottles containing 2 ml. of buffered salt solution containing 0.25 per cent lactalbumen hydrolysate. These bottles were supplied by the Virus Laboratory, and stocks were held by Command and Hospital Laboratories. Garglings were made with 10 ml. of isotonic saline and were collected in one-ounce bottles containing 5 ml. of inactivated serum broth. Both types of specimen were frozen immediately after collection in solid carbon dioxide and dispatched to the Virus Laboratory in thermos flasks by courier, passenger train or air freight. If solid carbon dioxide was not available, ice was used for packing specimens which could be sent to the Virus Laboratory in a few hours. Owing to the fact that broth is

often toxic to eggs, pathologists were encouraged to send throat swabs rather than garglings in 1957. It was thought that this would increase the chances of virus isolation, and the results of 220 consecutive attempts at the isolation of influenza virus in 1956-7 shown in Table 1 appear to bear out this theory. However, these specimens were sent under a variety of conditions, and the majority of the throat swabs were from cases due to the Asian (1957) virus, whilst most of the garglings were from cases due to A prime strains, so that too close a comparison would not be valid. That the problem of the collection and transmission of these specimens requires further investigation is shown by the failure of the laboratory to isolate virus from some outbreaks, and by the receipt of large numbers of toxic throat swabs from two of the centres dispatching specimens.

Table 1. *Results of attempts at influenza virus isolation in 1956-7*
(Figures in parentheses are percentages)

Type of Specimen ...	Total	Positive	Negative	Toxic
Garglings ...	34	8 (23)	20 (59)	6 (18)
Throat Swabs ...	186	74 (40)	87 (47)	25 (13)

First specimens of serum were taken as early as possible in the disease, and second specimens generally in the third week. Blood from cases retained in their own units was taken to the nearest laboratory, where the serum was separated. It was found more satisfactory for the paired sera to be sent together to the Virus Laboratory than for them to be sent separately. Little difficulty was experienced from contaminated serum, although the specimens were dispatched by post (airmail from overseas), but specimens of whole blood received by the Virus Laboratory were almost invariably badly hæmolysed and frequently anticomplementary.

LABORATORY INVESTIGATIONS

Virus isolation was attempted from garglings or from the fluid surrounding throat swabs. Specimens were held at -70° C. until they were required, when they were thawed, treated with antibiotics and inoculated into the amniotic cavities of ten-day-old chick embryos. The eggs were incubated for three days and the amniotic fluid was harvested and tested for the presence of virus by adding it to suspensions of fowl and human group O red blood cells. If hæmagglutination occurred, an extract of the embryo was made by freezing and thawing, and the virus was identified by using this extract as antigen in complement fixation tests with sera known to contain antibody to influenza viruses A and B.

Amniotic fluids in which virus was not detected were inoculated into the amniotic sacs of a further batch of eggs. Two passages were generally considered sufficient, but virus was not recovered after three amniotic passages of material from any of the ten serologically proved cases examined from the outbreak of influenza B.

Amniotic fluids containing virus were inoculated allantoically into eggs to provide sufficient virus for typing by hæmagglutination-inhibition. The allantoic fluids were dispatched to the World Influenza Centre, Mill Hill, where typing of virus A was undertaken. Only one isolation was made from the majority of outbreaks. Seventy-eight isolations of virus A were made from throat swabs and garglings during 1957, 21 being of the Dutch (1956) type and 57 of the Asian (1957) type.

Pieces of lung removed *post mortem* from fatal cases were ground up and examined bacteriologically. Suitable antibiotics were added to inhibit bacterial growth and the fluid was inoculated amniotically. Five of the nine specimens examined yielded virus A, all of the Asian type. The monthly incidence of virus isolations is shown in Table 2.

Serological investigations were limited to complement-fixation tests. Except when the epidemic was at its height in September and October, the second specimen of each pair was "screened" at a dilution of 1/8 against the following antigens: Influenza A, B and C; Sendai; Adenovirus; Psittacosis; *Rickettsia burneti* (Q fever).

Where a positive result was obtained in this screen test, the two sera from the case were titrated with the antigen concerned, using another antigen of the same type as a control. Thus, a positive screen test with influenza A soluble antigen was investigated by titrating the pair of sera in doubling dilutions from 1/4 to 1/128 with influenza A soluble antigen and from 1/4 to 1/16 with influenza B soluble antigen. Controls of all reagents used were set up at the same time. A fourfold or greater rise in titre was considered diagnostic.

While the epidemic was at its height, paired sera were titrated against influenza A and B antigens, and only those giving negative results were tested against the other antigens. This may have caused some mixed infections to be diagnosed as due to influenza A, but this was a minor disadvantage when weighed against the saving of time and antigens which enabled many more tests to be carried out without delay.

During the summer four troopships arrived at English ports from the Far and Middle East, after experiencing outbreaks during the voyage. It was too late to take specimens for virus isolation, as all the cases had recovered. However, a retrospective diagnosis was made by examining serum of convalescent cases. Several typical cases were selected in consultation with the medical officer of the ship, and specimens of blood obtained before they disembarked. The sera were titrated against influenza A and B. Most specimens gave titres of 1/32 or higher to influenza A, and this was considered adequate evidence of infection. Later, two ships arrived with outbreaks still in progress. Convalescent sera were used to make the diagnosis the day after the ships docked, and the cases in the acute phase of the disease were investigated in the ordinary way.

1,196 cases had diagnostic titres of antibody to influenza virus A, and 31 to influenza virus B. Table 2 gives the monthly incidence of these findings. The cases occurring in the first three months of the year were from outbreaks in Europe caused by the Dutch (1956) strain. Four of the seven serological positives

in April were also from these outbreaks. The remaining three cases and the two isolations were from Hong Kong, where the Asian strain of virus first attacked British troops. The remainder of the influenza outbreaks during the year were due to this strain.

Table 2. *Monthly incidence of positive results with influenza A in 1957*

Month	Virus Isolations	Complement Fixation Tests
January	4 (Dutch '56)	8
February	13 (Dutch '56)	58
March	4 (Dutch '56)	54
April	2 (Asian '57)	7
May	0	10
June	0	26
July	4 (Asian '57)	23
August	14 (Asian '57)	168
September	35 (Asian '57)	593
October	2 (Asian '57)	207
November	0	16
December	0	26
TOTALS ...	78	1,196

(Cases are grouped under the month in which the disease commenced)

SUMMARY

The experiences of the Virus Laboratory, Royal Army Medical College, in the investigation of influenza during 1957 are described.

The typing of strains of influenza virus A was carried out at the World Influenza Centre, and the co-operation of Drs. C. H. Andrewes and Alick Isaacs was greatly appreciated. The technical assistance of Mr. G. W. Thompson and Ptes. A. R. Fergie and C. W. Potter made this investigation possible. Too many medical officers to mention individually went to considerable lengths to provide specimens and information.

SALMONELLOSIS IN LIZARDS OF GHANA

BY

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MACKEY (1955), working in Dar-es-Salaam, Tanganyika, found the house lizard population to be heavily infected with salmonella organisms. Out of 301 lizards investigated by him from 1943 to 1953 he recovered salmonellæ from 144, giving the high figure of 48 per cent positive isolations. Two new types, *Salmonella mgulani* and *S. lindi*, were found. During 1956 an investigation of the types of salmonellæ carried by house lizards of Ghana was undertaken at this laboratory, specimens being collected from local districts including Accra, Legon Hill, Teshie, Takoradi, Winneba, Tamale, and Aburi.

MATERIALS AND METHODS

Lizard droppings were collected into Selenite F broth, incubated for 24 to 48 hours, and then subcultured on to desoxycholate citrate agar. Non-lactose-fermenters were selected for biochemical and serological investigation, and those showing the characteristics of a salmonella were forwarded to The David Bruce Laboratories for identification.

RESULTS

Up to December, 1956, 183 specimens of lizard droppings were examined, and of these 40 yielded salmonellæ, *i.e.*, 22 per cent.

In 28 instances the salmonellæ isolated were of known types, and these are listed below, the figure in brackets indicating the number of times the organism was isolated: *S. saint paul* (1), *S. stanleyville* (4), *S. ituri* (1), *S. newport* (2), *S. lindenburg* (2), *S. takoradi* (2), *S. canastel* var. monophasic (1), *S. london* (2), *S. seegefeld* (4), *S. rubislaw* (2), *S. alachua* (1), *S. waycross* (1) and *S. christianborg* (5).

In addition, six types, not previously described, were isolated, and the provisional names and antigenic structure of these are given below :

<i>S. legon</i>	4, 12 : c ; 1, 5	...	...	...	(1)
<i>S. tamale</i>	8, 20 : z ₂₉ ; —	...	...	...	(1)
<i>S. akuafo</i>	16 : y ; 1, 6	...	...	...	(6)
<i>S. ghana</i>	21 : b ; 1, 6	...	...	...	(1)
<i>S. kokomlemle</i>	39 : 1, v ; enx	...	...	...	(1)
<i>S. teshie</i>	47 : 1, z ₁₃ , z ₂₈ ; enz ₁₅	...	...	...	(1)

One salmonella remains unidentified. This had the somatic antigens 3, 10, but as motility could not be induced, flagellar antigens could not be ascertained.

DISCUSSION

In the present series, the percentage of positive results compared unfavourably with that described by Mackey, being only 22, but six salmonellæ not previously described were recovered.

Comparing the results obtained in Dar-es-Salaam with those obtained in Ghana, only three types of salmonella appear to be common to both areas, viz. *S. newport*, *S. rubislaw*, and *S. waycross*.

As part of a survey of salmonellosis in Ibadan, Collard and Montefiore (1956) conducted a similar investigation by culturing the contents of the large bowel of lizards. They isolated salmonellæ from 11.2 per cent of a total of 110 agamid lizards, listing five known types (*S. elizabethville*, *S. kingston*, *S. kaapstad*, *S. durham* and *S. takoradi*) and a new type with the provisional antigenic formula 4, 12: i; 1, 6.¹

SUMMARY

183 specimens of droppings from house lizards in Ghana were examined for salmonellæ; 40 were positive. Six hitherto undescribed types were isolated. The names and antigenic structure of these new types are given.

I wish to thank the Officer Commanding and staff, The David Bruce Laboratories, for investigating the organisms and my colleagues Captains Cathro, Murphy, Harris and Williams for their help.

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ECHOES FROM THE PAST. No. 1

THE life of the soldier, like every other life of irregular exertion and hardship, predisposes him to disease while, from the nature of the service, the treatment of military diseases differs from common practice, and requires peculiar experience, both in preventing the attack and also rendering their cure speedy and complete. Having it in mind that military practice requires bold and energetic measures; and that the soldier's absence from duty on the day of actual service is perhaps an irreparable loss to the country . . . hence the necessity of a medical officer possessing superior professional knowledge to others, much decision, and a good deal of acquired experience.

(Extract from a letter written in 1808 by Dr. Nisbet to His Royal Highness The Duke of York. Quoted by Surgeon-Major A. A. Gore in *The Story of Our Services under the Crown*. London, 1879. Baillière, Tindall & Cox.)

¹ This is now included in the Kauffman-White Scheme as *S. agana*.—Ed.

EBSTEIN'S DISEASE

A CASE REPORT

BY

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IN 1866 Ebstein described a congenital deformity of the heart in which the tricuspid valve was displaced into the right ventricle, but it is only in recent years with the advent of cardiac catheterisation and angiocardiology that cases have been successfully diagnosed during life. A further case is now reported in which the diagnosis was suspected clinically and later confirmed by angiocardiology.

CASE REPORT

A nineteen-year-old National Service man was admitted to hospital with a history of breathlessness on exertion for as long as he could remember. He had been unable to play games at school and on joining the Army he could not keep up with normal infantry training, becoming very breathless when marching and on one occasion losing consciousness. There was no history of nocturnal dyspnoea, œdema of the ankles or cyanosis.

He had been aware at times of a rapid pounding of his heart on exertion, but had had no attacks suggestive of true paroxysmal tachycardia. On examination he was a well-built man of normal proportions. He had a moon-shaped face with a malar flush. There was no cyanosis or clubbing. The pulse was small in volume and regular, the rate being 70 a minute at rest. The blood pressure was 110/70.

A 5 cm. "a" wave was visible in the jugular venous pulse. There was obvious cardiac enlargement, the apex beat being half an inch outside the mid-clavicular line in the 5th left intercostal space with dullness to percussion in the 3rd and 4th intercostal spaces to the right of the sternum. An atrial gallop was audible on auscultation, but no murmurs were heard at rest or after exercise. Hepatic pulsation was visible in the epigastrium, increasing on inspiration and synchronous with the "a" wave in the neck.

Investigations

X-rays showed cardiac enlargement with C-T ratio of 0.56. The enlargement appeared to be mainly of the right heart. The aorta was small and there was no undue prominence of the pulmonary conus. The pulmonary vascular shadows were diminished (Fig. 1).



Postero-Anterior View

Fig. 1. Teleradiogram showing enlargement of the heart with a prominent right auricle.

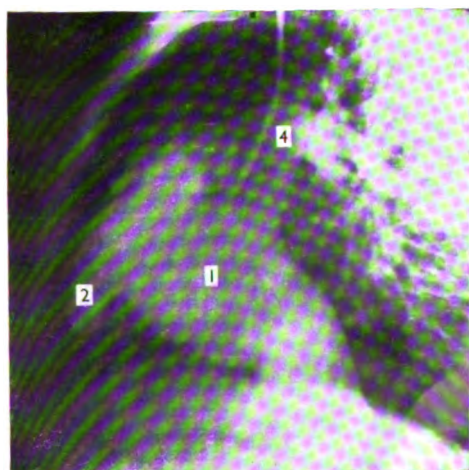
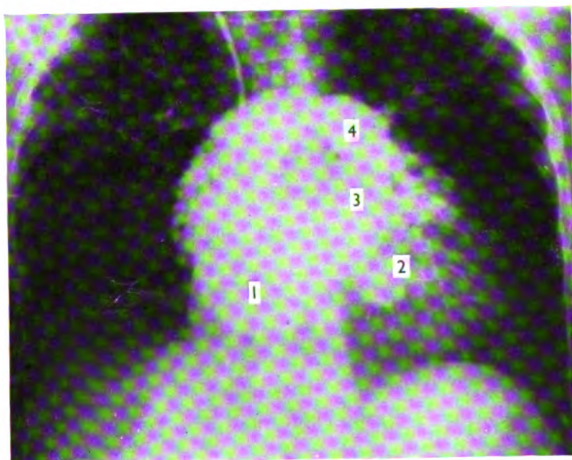
Fig. 4 A

Fig. 4. Angiocardiogram.

A. Antero-posterior film at $3\frac{1}{2}$ secs. showing large right auricle (1), small displaced right ventricle (2), the right ventricular outflow tract (3), and normal pulmonary artery (4).

B. Left lateral film at $11\frac{1}{2}$ secs.

C. Left lateral film at $11\frac{1}{2}$ secs. showing filling of left auricle (5).



B



C

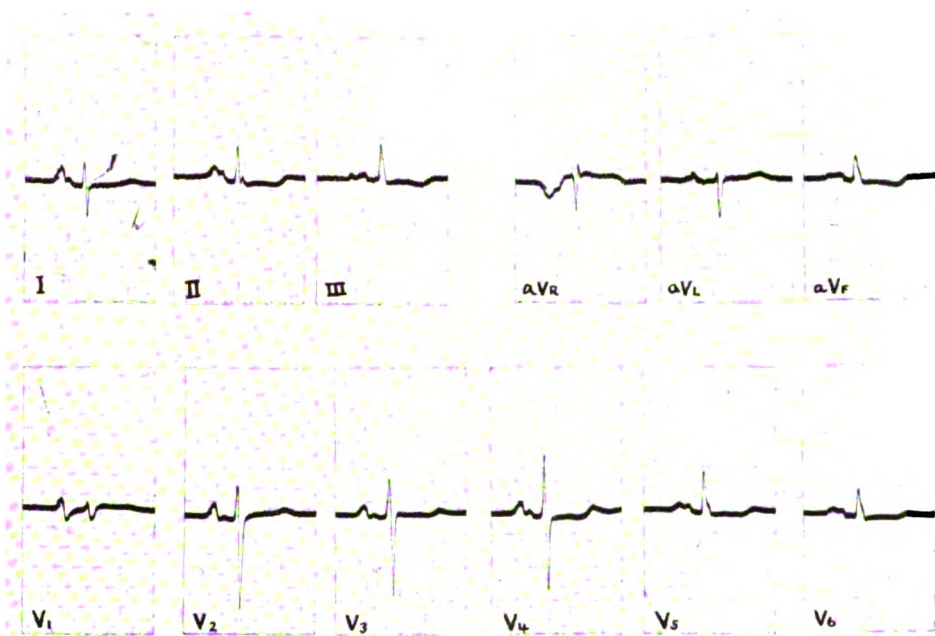


Fig. 2. Electrocardiogram showing large bifid P waves

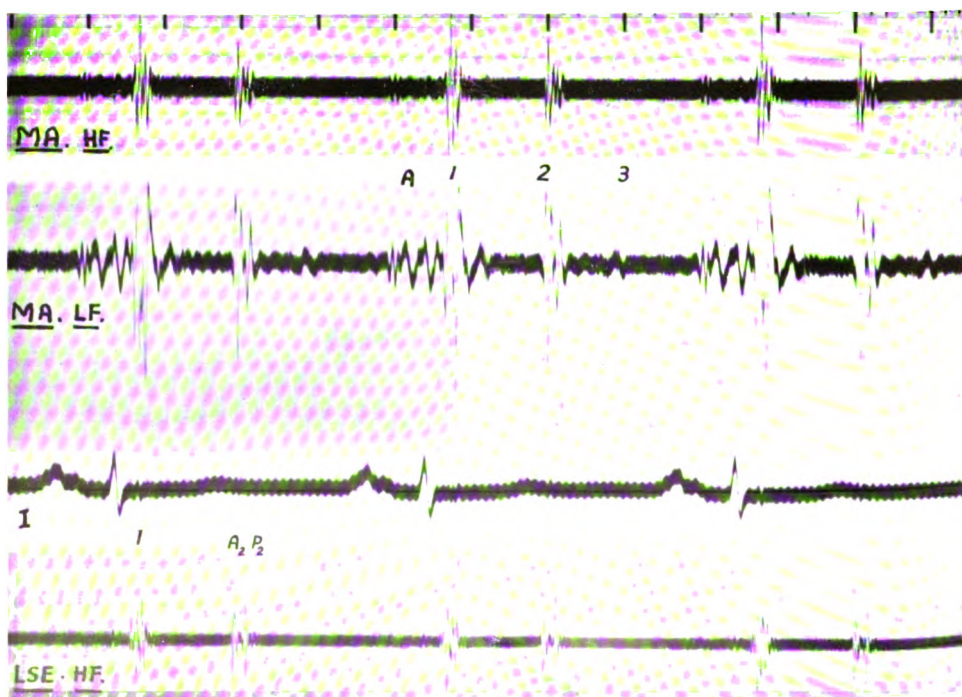


Fig. 3. Phonocardiogram showing loud auricular vibrations (A) with a split 2nd sound and small 3rd heart sound.

M.A. = Mitral Area
H.F. = High Frequency

L.S.E. = Left Sternal Edge
L.F. = Low Frequency
(Time marker 0.2 sec.)

The electrocardiogram showed right axis deviation with giant bifid P waves (Fig. 2).

A phonocardiogram showed exaggerated auricular vibrations coincident with the P waves in the E.C.G., a small third heart sound and splitting of the second sound (Fig. 3). The diagnosis of Ebstein's disease was confirmed by the angiocardiogram. This showed a very large right atrium and atrial appendage with a small right ventricle which was displaced to the left and extended up to the position normally occupied by the left atrial appendage. The tricuspid opening appeared to lie to the left of the body of D 9-10 in the antero-posterior view. There was marked retention of contrast medium in the right side of the heart with a prominent reflux into huge inferior vena caval and hepatic veins. The rate of flow through the right atrium and right ventricle was much slower than normal and the body of the right ventricle appeared to be almost a back-water. The pulmonary trunk was not enlarged, and the right and left branches were a little smaller than normal. There was delay in the passage of the medium through the lungs and filling of the left atrium was first obvious $10\frac{1}{2}$ seconds after the first film (Fig. 4).

DISCUSSION

In Ebstein's disease the tricuspid valve is situated below its normal site and divides the right ventricle into two chambers, a proximal one which is continuous with and incorporated into the right atrium, and a distal one consisting of the small distal portion of the right ventricular cavity together with the pulmonary outflow tract. In addition to this displacement the valve is structurally abnormal, the anterior and posterior cusps at autopsy often being fused to form a thin membranous sheet which may have numerous fenestrations and which is attached to the apex of the right ventricle by rudimentary chordæ tendineæ and papillary muscles. Although the valve is thus displaced and distorted it may remain competent until the terminal stages, and several reported cases have only developed tricuspid incompetence, as shown by liver pulsation, shortly before death. In the present case the liver pulsation is presystolic in time and is considered to be due to exaggerated atrial contraction rather than to any valvular incompetence. Patent foramen ovale or atrial septal defect has frequently been described as an associated anomaly, and increasing pressure in the right heart may lead to a right to left shunt and consequent central cyanosis. There is wide variation in the severity of the symptoms depending upon the degree of malformation of the valve and the presence or absence of an atrial septal defect. These may vary from mild breathlessness on exertion and easy fatigability, as in the present case, to severe incapacity associated with gross cyanosis and squatting. Baker, Brinton & Channell (1950) in discussing the prognostic significance of cyanosis showed in their series that the average age of death was 12 years in those cases who had been cyanosed from infancy, but in the absence of cyanosis survival to old age was possible, two of their cases living to over 60.

Adams & Hudson (1956) have also described a case without cyanosis who survived to the age of 79 and died of unassociated suppurative cholangitis.

The prognosis in this case, therefore, appears to be relatively good, though sudden death is common in Ebstein's disease and may occur following exercise as in the case reported by Kerwin (1955). Other recognised features of this condition, but which were absent in our case, are the presence of systolic and diastolic murmurs, quadruple rhythm and bizarre forms of bundle branch block as seen on the electrocardiogram. In a series of 27 cases reviewed by Medd, Matthews & Thursfield (1954), right bundle branch block was noted in 20 cases and delayed conduction in 9. In our case the electrocardiogram showed high bifid P waves characteristic of the condition, but gave no evidence of either right bundle branch block or delayed atrio-ventricular conduction.

Angiocardiography is the safest way of confirming the diagnosis. The large slowly emptying right atrium is visualised and early opacification of the left atrium is seen in those cases that have an associated atrial septal defect. Soloff, Stauffer & Zatuchni (1951) described a filling defect due to the displaced tricuspid valve, but this is not seen in all cases. Although the findings of cardiac catheterisation are also characteristic, Campbell (1953) has pointed out that this procedure is dangerous and should not be carried out unless there are very special reasons for it.

The large quiet heart so characteristic of the disease has to be differentiated from a pericardial effusion which it may simulate clinically and radiologically. Cyanotic cases may be confused with pulmonary stenosis with inter-atrial communication, or with Fallot's tetralogy. For this reason the accurate diagnosis of Ebstein's disease during life has assumed a new importance with the increasing use of surgery in congenital heart disease, as no surgical procedure has yet been devised for this condition and surgical interference has so far proved uniformly fatal.

We thank Dr. D. Evan Bedford of the Middlesex Hospital for his interest and help in this case; Dr. J. N. Pattinson of the Middlesex Hospital for the angiocardiogram; Dr. J. P. D. Mounsey of the London Hospital for the phonocardiogram; and Mr. D. E. Tomkinson of the Royal Army Medical College for the photographs.

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ESCHERICHIA COLI GASTRO-ENTERITIS IN A MILITARY HOSPITAL

BY

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EPIDEMIC infantile gastro-enteritis due to the specific serological types of *Escherichia coli* is the most infectious disease that is regularly admitted to hospitals in England, and there are at present no successful methods of preventing cross-infection by these organisms (Rogers, 1956). Jameson, Mann & Rothfield (1954) describe a large outbreak in which control was only achieved by complete closure of an infected ward.

This paper describes a small outbreak which originated in a military hospital. *E. coli* serotype 0.26 (not previously found in the area) was isolated from three cases and two symptomless excretors. Control was achieved by closure of the infected ward, although the adjacent maternity unit having the same staff was kept open. The purpose of this paper is to draw attention to an infection unusual in military hospitals and to describe control measures thought to be successful.

THE OUTBREAK

Three infants, one aged 9 months and two aged 3 months, were taken suddenly and severely ill almost simultaneously on the evening of Monday, 21st January, 1957. The babies were seen by one of us (R.M.C.) in their own homes and were found to be collapsed and dehydrated as a result of profuse vomiting and diarrhoea. They were admitted immediately to the local civil hospital where *E. coli* serotype 0.26 was isolated from all three next day. Treatment by fluid and electrolyte replacement and neomycin effected eventual cure. A fourth infant, aged 12 days, also developed severe diarrhoea and vomiting in its own home and was admitted to the civil hospital on 23rd January, 1957. This baby also recovered, but as no pathogenic organism was isolated from the faeces it may not have been a case of the same infection.

INVESTIGATIONS

Cases

All four babies had at one time been patients in the military hospital prior to the outbreak. The first three infants had been together in the families' ward, the fourth child had been in a separate ward in the maternity unit. Table 1 summarises the relevant data.

Table 1. *Details of the cases*

Families' ward	Date admitted military hospital	Date discharged military hospital	Date of onset of symptoms
Case 1	5 Jan.	15 Jan.	20 Jan.
Case 2	11 Jan.	21 Jan.	21 Jan.
Case 3	16 Jan.	21 Jan.	21 Jan.
Maternity ward			
Case 4	11 Jan. (born in hospital)	21 Jan.	23 Jan.

Incubation Period

All four babies were on artificial feeding, three being bottle fed and the oldest one on ordinary food. From Table 1, and from later information which indicated that case 2 may have caused the outbreak, an incubation period of between five and nine days is suggested in cases 1 and 3. Rogers (1956) states that within three to five days of admission of one ill baby other babies in the ward start to excrete the specific types of *E. coli* and in a few more days some of them are suffering from gastro-enteritis due to these organisms.

The sudden onset of symptoms is apparent in that cases 2 and 3 were taken severely ill within a few hours of discharge from hospital. They were of course clinically well when discharged earlier that day. The almost simultaneous onset in cases 1, 2 and 3 is of interest and might suggest spread of infection from one particular feeding incident.

Fæces from all the medical, nursing and other staff were investigated by the laboratory and an adult female hospital cleaner was found to be excreting *E. coli* of the specific serotype. This cleaner's duties brought her in close contact with the babies in the infected ward. Two older children in the ward at the same time as the babies remained negative. The families of all three babies were investigated bacteriologically. An eight-year-old brother of case 2 was found to be excreting *E. coli* of 0.26 serotype also. This boy had no contact with his brother after the latter entered hospital. It was considered likely that the outbreak originated in this family, the symptomless excreter infecting his brother who brought the infection into the military hospital and passed it on to the other babies and to the adult excreter. That the adult excreter was probably secondarily infected was supported by her statement that both she and her husband suffered a mild attack of diarrhœa about 14th January. If this is so it would point to a three-day incubation period in her case, but this evidence is inconclusive as neither she nor her husband was certain about the actual date of onset. The latter had no contact with the hospital and was probably infected by his wife, although his stools were negative, as were those of the other two children in this family. Laboratory investigations in this family were carried out some days after the outbreak and it is possible that this family had overcome their infection, the two children having had a symptomless attack at an earlier date.

To summarise the laboratory investigations, out of 58 persons examined

bacteriologically, *E. coli* type 0.26 was recovered from three cases and from two symptomless excreters.

PREVENTION AND CONTROL

The infected ward was closed immediately and thorough disinfection was carried out. The adjoining maternity ward was not closed. The two remaining patients, both older children, were removed to another ward and were put on prophylactic sulphasuccidine. The doctors, nurses and other staff connected with the infected ward were also put on sulphasuccidine, as were the mothers and new-born babies in the adjoining maternity unit. It was considered that this was justified in that it might prevent the further spread of infection and also modify the severity of any subsequent infection in the infants. Fortunately no further cases occurred, probably largely due to the prompt closure of the infected ward. Neomycin (Rogers *et al.*, 1956) would probably have been the prophylactic of choice, but it was not immediately available. This drug was used in treating the two symptomless excreters subsequently discovered. In the case of the adult excreter, sulphasuccidine was used for a week, a negative stool specimen was then obtained, but the specific serotype was isolated again a few days later. She was then put on neomycin and has remained negative. The boy excreter was successfully treated with neomycin from the start and has subsequently remained negative. The three babies were treated with neomycin in the civil hospital and remained free from infection on their return home.

Strict barrier nursing technique was introduced throughout the military hospital with particular attention to mask and gown drill, preparation of babies' feeds, laundry arrangements and disposal of soiled clothing and excreta. These measures were especially important in the maternity unit where it was not possible to maintain a separate nursing staff whose duties would be confined to that unit only. That no further cases occurred must be a tribute to the prompt action and the will with which preventive measures were carried out by all concerned.

DISCUSSION

Control measures put into effect immediately were :

1. No further patients admitted to the families' ward in which the cases had originated. This ward was then closed and disinfected.
2. Prophylactic treatment for infants in adjoining maternity ward.
3. Bacteriological investigation of patients, infants and all staff, with treatment and isolation of excreters.
4. Bacteriological investigation of family contacts of cases.

The detection of a symptomless excreter among the staff handling infants almost certainly prevented spread to the maternity ward, as also did closure and disinfection of the families' ward.

The use of chemoprophylactic drugs seemed justified, although neomycin, the drug of choice (Rogers, 1956), would have been used had it been available initially. The general finding that hospital cross-infection by these organisms is not preventable by present methods is a serious matter. Rogers (1956) suggests specially designed cell units for each child in the ward, each with its own equipment. In effect he is suggesting that each cell should be an isolated unit. In practice the staffing and administration required to achieve this optimum is probably beyond the resources of most military hospitals. A large nursing staff is an essential prerequisite to effective barrier-nursing. In this connection Rogers draws attention to the tendency of senior members of the medical profession to ignore barrier-nursing rules. It is, of course, essential that all doctors should observe the rules and set an example if the system is to be effective.

The risks of cross-infection in bottle-fed babies are well appreciated nowadays. McFarlan *et al.* (1949) found coliform organisms more frequently in the bacterial flora of the throats of artificially fed infants than of those entirely breast fed. In this outbreak it is thought that infected feeds may have started the outbreak. The prevention of cross-infection must depend very largely on an efficient milk kitchen. Ramsay (1955) defines the optimum requirements and these are well worth repeating :

- (a) The nurse responsible for the feeds for 24 hours should *not* enter the ward until her duties in the milk room are complete for the day.
- (b) Feeds when assembled should be autoclaved for 30 seconds at 10 lb. pressure.
- (c) Feeds should be transferred then to a refrigerator and should remain there until just before use.
- (d) Bottles should then be reheated to blood heat.
- (e) The rubber cover over the teat should only be removed before the bottle is given to the baby.

Factors precipitating an outbreak, once infection is introduced, are not understood, but Rogers (1956) states that an attack of enteritis in a baby excreting one of the specific types of *E. coli* is often precipitated by a change of diet or by a super-added respiratory tract infection. In the present outbreak the latter factor was operative in all three cases.

In view of the difficulty of controlling spread of these infections in an infants' ward the exclusion of excretors from a clean ward merits consideration, although it is not usually practicable except in large hospitals.

In the Surrey area 22 of 1,044 (2.1 per cent) of children up to five years old admitted to day nurseries were found to be excreting *E. coli* specific serotypes (Cook, 1957). The incidence among well children in other areas may be higher.

The importance of immediate bacteriological examination of any patient with gastro-intestinal symptoms is emphasised.

SUMMARY

An outbreak of infantile gastro-enteritis due to *E. coli* serotype 0.26 in a military hospital is described.

Immediate preventive measures confined the outbreak to three cases and two excretors.

Some problems of cross-infection and methods of prevention are discussed in relation to children's wards in military hospitals.

We are indebted to Dr. G. H. Tee, of the Dorchester Public Health Laboratory, who carried out the bacteriological investigations.

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Book Reviews

FLUID BALANCE IN SURGICAL PRACTICE. By L. P. Le Quesne, D.M., F.R.S.C.
Second Edition. London: Lloyd-Luke (Medical Books Ltd.). 1957.
140+vii. Illustrated. 20s.

The second edition of this very useful and instructive book has appeared. Excellent as the first edition appeared to be, it is apparent that this new edition is even better. Fluid balance has become all important in the management of surgical cases and it should be understood by all who have in their hands the care of such patients. This book should be in the possession of every surgeon, surgical registrar and house surgeon, not only as a book of reference but for essential study.

A. G. D. W.

THE EARLY DIAGNOSIS OF THE ACUTE ABDOMEN. By Sir Zachary Cope, B.A., M.D., M.S., F.R.C.S. 11th Edition. London: Oxford University Press. 1957. Pp. 188. Illustrated. 18s.

This is now the eleventh edition of this book and so speaks for itself. Moreover, it is the work of an elder surgical statesman who is very active and very much to the fore. It is full of the wisdom of experience on a subject important to all practitioners and not least to the surgeon himself, although the author only recommends it to students, house officers and general practitioners. The new additions to the illustrations and radiographs increase the value of this book which should be available to all who practise medicine with the patient.

A. G. D. W.

FAT CONSUMPTION AND CORONARY DISEASE—AN EVOLUTIONARY ANSWER TO THIS PROBLEM. By T. L. Cleave, M.R.C.P. Bristol : John Wright & Sons. 1957. Pp. 40. 5s.

This very interesting monograph approaches the subject from an entirely new angle, showing how civilised man has strayed from the diet which has been selected for him by nature. The author advances his argument by logically connected steps, but he admits that, in practice, the application of his dietary principles will require more than the average determination, together with complete confidence in the logic and safety of these principles and a very real reverence for the human body—qualities which are likely to be only too rare in this imperfect world.

J. A. G. C.

PRACTICAL DERMATOLOGY. By Samuel M. Peck, B.S., M.D., and Lawrence L. Palitz, M.D., Ph.D. New York : Landsberger Medical Books Inc. Distributed by McGraw-Hill Book Company, London. 1956. Pp. 380 + xviii. Illustrated. 52s. 6d.

This little book achieves what it sets out to do, namely, to be a handbook for general practitioners. No common condition is omitted, nor is any uncommon one included unnecessarily. The descriptions of the various diseases, while on the whole good, are in some instances rather long-winded, and abbreviation would result not only in saving of space but also in greater clarity of expression. The sections on treatment are excellent, and possess the merit, all too rare in textbooks, of being right up to date. While the reviewer would differ with the author in certain specific instances, generally speaking the lines of treatment recommended are those accepted as orthodox among English-speaking dermatologists. In general the reproduction of the photographs is bad. The price of 52s. 6d. for a book of this sort may place it beyond the means of many.

P. C. M.

THE EPIDEMIOLOGY AND CONTROL OF MALARIA. By G. MacDonald, C.M.G., M.D., F.R.C.P. London : Oxford University Press. 1957. Pp. 256 + xv. Illustrated. 30s.

The tremendous volume of published material from malaria studies all over the world has provided a wealth of information about the effects of the epidemic disease and different degrees of endemicity on populations at risk. Attempts to control the disease by current methods have in some cases had a spectacular success but in others, especially in tropical Africa, they have failed to interrupt transmission. The reason for success in one country and failure in another of identical measures against the same disease can only be found by a careful study of the epidemiology of malaria.

There are many factors concerned in the transmission of malaria, but the conventional biological approach to epidemiology cannot explain the precise importance of the various factors and their relationship to one another in the local spread of the disease. These factors can, however, be related mathematically,

and the importance of each in local conditions at once becomes apparent. There is a tendency to regard with suspicion the mathematical approach, but this book has been written for the non-mathematical reader, and gives a clear exposition of the method and its application to control. It explains the wide differences in the intensity of malaria transmission in different parts of the world. It also explains how in certain places the disease can be eliminated with little effort while in others, where the infection rate is very high, transmission can only be interrupted by the application of carefully selected measures under close supervision. The chapters on malaria survey and its interpretation are invaluable in this respect as they describe the minimum data required for the planning of a control scheme best suited to local conditions. Appendix II gives details of the techniques required for field and laboratory study in malaria survey, both pre-operational and in parallel with existing projects.

Attention is drawn to the need to place more emphasis on entomology in malaria control and also to the necessity for more precise recording of data, both entomological and hæmatological, in survey work. A useful reference system is provided at the end of each chapter so that the reader can select his bibliography according to his requirements.

This book constitutes a novel and most important advance in the epidemiology of the disease and its control. Short and very readable, it is highly recommended to all those who work in the malaria field.

M. A. C. D.

A GUIDE TO HUMAN PARASITOLOGY. By D. B. Blacklock, M.D., and T. Southwell, D.Sc. 6th Edition revised by T. H. Davey, O.B.E., M.D., D.T.M. London : H. K. Lewis & Co. Ltd. 1958. Pp. 222 + vii. Illustrated. 30s.

This edition is a considerable improvement on the last and comes much nearer the original claim made that it is a textbook for the Diploma of Tropical Medicine and Hygiene, although there are still a few omissions.

It is well illustrated and contains three coloured plates : it should continue to prove of great value to practitioners at home and abroad who have no specialised knowledge of this subject.

L. R. S. M.

THE RESPIRATORY MUSCLES AND THE MECHANICS OF BREATHING. By E. J. Moran Campbell, M.D., M.R.C.P. London : Lloyd-Luke (Medical Books) Ltd. 1957. Pp. 131 + xvi. Illustrated. 20s.

This monograph deals exhaustively with the physiology of human respiration. After a detailed description of the anatomy and function of each of the muscles involved in respiration, the whole subject of respiratory behaviour is discussed clearly and logically and the conclusions supported by diagrams of Dr. Campbell's electromyographic studies.

Although it would seem that this book is intended essentially for the clinical physiologist, there is much in it to interest the physician, the radiologist and the physiotherapist, and every anæsthetist is recommended to include it in his reading when preparing for the Primary F.F.A. examination.

K. F. S.

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INDEX TO VOLUME 104

	PAGE		PAGE
Acute Spinal Epidural Infection—D. D. Gibbs	93	Common Stresses in a Military Environment—H. L. Freeman	31
Address to Physicians of the Allied Forces by the late Pope Pius XII	201	Complimentary Messages on Diamond Jubilee of the Corps	110
Adenoides Cysticum, An Unusual Case of Epithelioma—A. R. Pate and P. D. Stewart	87	Construction of a Mass Miniature Radiography Vehicle—R. M. Hector	223
Aeromedical Evacuation, Army Concepts of Forward—Based on a paper by Thomas N. Page	35	Corcoran, T. M.—Radiology, 1948-1958	162
Ahern, T. M. R.—The Field Training Centre	168	CORRESPONDENCE:	
Anæsthesia, 1948-1958—K. F. Stephens	159	Brown, J. A. H. and H. S. Bedson—The Dangerous Universal Donor	48
Antarctica, The Royal Society International Geophysical Year Expedition to—R. A. Smart	189	A. P. Trimble—Penicillin in the Treatment of Leptospirosis	49
Apprentices School, The R.A.M.C.—W. A. Robinson	175	E. Grey-Turner—167 (City of London) Field Ambulance	104
Archer, G. T. L.—The Army Pathology Service, 1948-1958	148	Crush Injury of the Chest by Intermittent Positive Pressure Respiration and Continuous Curarisation, Treatment of—J. A. Thornton	226
Archer, T. C. R.—Civil Affairs—Port Said—1956	81	Curarisation, Treatment of Crush Injury of the Chest by Intermittent Positive Pressure Respiration and Continuous—J. A. Thornton	226
Archer, T. C. R.—Medical Problems of the Operational Infantry Soldier in Malaya	1	Cyprus, The Health and Social Services of—G. F. Neild	51
Army Concepts of Forward Aeromedical Evacuation—Based on a paper by Thomas N. Page	35	Decade of Medicine in the Army—R. A. Bennett	128
Army Health Organisation, 1948-1958, The—M. M. Lewis	139	Decade of Surgery in the Army—J. Huston	133
Army Medical Department Statistics—S. Rosenbaum	164	Dental Corps during the last ten years, The Royal Army—D. J. Muil	166
Army Pathology Service, 1948-1958, The—G. T. L. Archer	148	Diamond Jubilee of the Royal Army Medical Corps	103
Army Psychiatry, 1948-1958—R. Philipson	151	Diamond Jubilee of the R.A.M.C., Commemorative Oration on the Occasion of the—G. Gordon-Taylor	116
Barber, Wilfred—Surgery and the Mau Mau	41	D.G.A.M.S. Annual Exercise, Exercise "Medical Automedon" 1957—F. M. Richardson	71
Battle, R. J. V.—Burns—The First Five Days in the Treatment of Mass Casualties	203	Director-General's Broadcast Message to the Corps	114
Bodman, R. I.—Recent Advances in the Transport of Casualties	179	Drummond, W. A. D.—The Years Between	112
Bennett, R. A.—A Decade of Medicine in the Army	128	Ebstein's Disease—R. S. Williams and J. A. G. Carmichael	238
Broadcast Message to the Corps, Director-General's	114	Echoes from the Past, No. 1	237
Burbridge, D. H. D.—The New Training Burns—The First Five Days in the Treatment of Mass Casualties—R. J. V. Battle	171	École du Service de Santé, Officer Training in the French Medical Services: A. V. Nash	27
Carmichael, J. A. G., joint author—See Williams	238	Editorial—Diamond Jubilee of the Corps	111
Casualties, Recent Advances in the Transport of—R. I. Bodman	179	Elizabeth the Queen Mother, Message from H.M. Queen—	109
Chalke, Dr. H. D.—Extract of a Speech made by—	200	Epidural Infection, Acute Spinal—D. D. Gibbs	93
Chemoprophylaxis of Gas Gangrene, The—L. P. Garrod	209	Epilogue	200
Civil Affairs—Port Said—1956—T. C. R. Archer	81	Epithelioma Adenoides Cysticum, An Unusual Case of—A. R. Pate and P. D. Stewart	87
Coli Gastro-Enteritis in a Military Hospital, Escherichia—J. G. P. Power	241	Escherichia Coli Gastro-Enteritis in a Military Hospital—J. G. P. Power	241
Commemorative Oration on the Occasion of the Diamond Jubilee of the R.A.M.C.—G. Gordon-Taylor	116	Exercise "Medical Automedon," D.G.A.M.S. Annual Exercise, 1957—F. M. Richardson	71
		Expedition to Antarctica, Royal Society International Geophysical Year—R. A. Smart	189
		Extract of a Speech made by—Dr. H. D. Chalke	200

	PAGE		PAGE
Field Training Centre, The—T. M. R. Ahern	168	Mass Casualties, Burns—The First Five Days in the Treatment of—R. J. V. Battle	203
First Five Days in the Treatment of Mass Casualties, Burns—The—R. J. V. Battle	203	Mass Casualties to R.A.M.C. Recruits, The Teaching of Support Treatment of—M. J. P. Webster	174
Forward Aeromedical Evacuation, Army Concepts of—Based on a paper by—Thomas N. Page	35	Mass Miniature Radiography Vehicle, Construction of—R. M. Hector	223
Freeman, H. L.—Common Stresses in a Military Environment	31	Mau Mau, Surgery and the—Wilfred Barber	41
French Medical Services, Officer Training in the: l'Ecole du Service de Santé—A. V. Nash	27	"Medical Automedon," D.G.A.M.S. Annual Exercise, 1957—F. M. Richardson	71
Garrod, L. P.—The Chemoprophylaxis of Gas Gangrene	209	Medical Problems of the Operational Infantry Soldier in Malaya—T. C. R. Archer	1
Gas Gangrene, The Chemoprophylaxis of—L. P. Garrod	209	Medical School, The Val-de-Grâce Church, Hospital, Museum and—A. N. T. Meneces	22
Gastro-Enteritis in a Military Hospital, Escherichia Coli—J. G. P. Power	241	Medicine in the Army, A Decade of—R. A. Bennett	128
Geophysical Year Expedition to Antarctica, The Royal Society International—R. A. Smart	189	Meneces, A. N. T.—The Val-de-Grâce Church, Hospital, Museum and Medical School	22
George, J. B.—Ophthalmology since 1948	154	Messages, Complimentary	110
Ghana, Salmonellosis in Lizards of—E. E. Vella	236	Message from H.M. Queen Elizabeth the Queen Mother	109
Gibbs, D. D.—Acute Spinal Epidural Infection	93	Message to the Corps, Director-General's Broadcast—	114
Harrison, G. Kent, joint author— <i>See</i> Large	216	Miles, A. A.—The Toxicity of Intracutaneous T.A.B. Vaccine	89
Hart, R. J. C.—The Investigation of Influenza in the Army in 1957	232	Military Environment, Common Stresses in a—H. L. Freeman	31
Health and Social Services of Cyprus—G. F. Neild	51	Muil, D. J.—The Royal Army Dental Corps during the last ten years	166
Health Organisation, 1948-1958, The Army—M. M. Lewis	139	Murtagh, P.—The R.A.M.C. Other Rank	178
Hector, R. M.—Construction of a Mass Miniature Radiography Vehicle	223	Nash, A. V.—Officer Training in the French Medical Services: l'Ecole du Service de Santé	27
Hospital Planning—D. S. Paton	181	Neild, G. F.—The Health and Social Services of Cyprus	51
Huston, J.—A Decade of Surgery in the Army	133	New Training, The—D. H. D. Burbridge	171
Influenza from Western Command, A Symposium on—	14	Non-Gonococcal Urethritis, Tetracycline Hydrochloride in the Treatment of—R. R. Willcox	44
Influenza in the Army in 1957, The Investigation of—R. J. C. Hart	232	Obituary—Major-General Sir Courtenay Manifold	47
International Geophysical Year Expedition to Antarctica, The Royal Society—R. A. Smart	189	Obituary—Major-General D. T. Richardson	99
Intracutaneous T.A.B. Vaccine, The Toxicity of—A. A. Miles	89	Observations on Snakes and Snake Bite in the Eastern Mediterranean Area—J. L. Turk	63
Investigation of Influenza in the Army in 1957, The—R. J. C. Hart	232	Officer Training in the French Medical Services: l'Ecole du Service de Santé—A. V. Nash	27
Jubilee of the R.A.M.C., Commemorative Oration on the Occasion of the Diamond—G. Gordon-Taylor	116	Ophthalmology since 1948—J. B. George	154
Laird, A. N., joint author— <i>See</i> Large	216	Oration on the Occasion of the Diamond Jubilee of the R.A.M.C., Commemorative—G. Gordon-Taylor	116
Large, S. E., A. N. Laird and G. Kent Harrison—Lung Resection for Tuberculosis in the Army	216	Other Rank, The R.A.M.C.—P. Murtagh	178
Lewis, M. M.—The Army Health Organisation, 1948-1958	139	Otolaryngology, 1948-1958—H. N. Perkins	157
Lizards of Ghana, Salmonellosis in—E. E. Vella	236	Page, Thomas N. Army Concepts of Forward Aeromedical Evacuation. Based on a paper by—	35
Lung Resection for Tuberculosis in the Army—S. E. Large, A. N. Laird and G. Kent Harrison	216	Pate, A. R. and P. D. Stewart—An Unusual Case of Epithelioma Adenoides Cysticum	87
Malaya, Medical Problems of the Operational Infantry Soldier in—T. C. R. Archer	1		

	PAGE		PAGE
Pathology Service, 1948-1958, The Army		Macdonald, G.—The Epidemiology	
—G. T. L. Archer	148	and Control of Malaria	246
Paton, D. S.—Hospital Planning	181	Manson-Bahr, P. H.—Synopsis of	
Perkins, H. N.—Otolaryngology, 1948-		Tropical Medicine	102
1958	157	Palitz, L. L., joint author—See Peck	246
Phillipson, R.—Army Psychiatry, 1948-		Peck, S. M. and L. L. Palitz—Practical	
1958	151	Dermatology	246
Planning, Hospital—D. S. Paton	181	Refresher Course for General Prac-	
Pope Pius XII, Address to Physicians of		titioners (Third B.M.J. Collection)	102
the Allied Forces by the late—	201	Rodgers, L.—Guerilla Surgeon	13
Port Said, Civil Affairs—T. C. R. Archer	81	Southwell, T., joint author—See Black-	
Positive Pressure Respiration and Con-		lock	247
tinuous Curarisation, Treatment of		Tidy, H. (editor) and R. Milnes Walker	
Crush Injury of the Chest by Inter-		(joint editor)—The Medical Annual,	
mittent—J. A. Thornton	226	1957	102
Power, J. G. P.—Escherichia Coli Gastro-		Walker, R. Milnes, joint editor—See	
Enteritis in a Military Hospital	241	Tidy	102
Problems of the Operational Infantry		Richardson, F. M.—Exercise "Medical	
Soldier in Malaya, Medical—T. C. R.		Automedon," D.G.A.M.S. Annual	
Archer	1	Exercise, 1957	71
Psychiatry, 1948-1958, Army—R. Phillip-		Robinson, W. A.—The R.A.M.C. Ap-	
son	151	prentices School	175
Queen Elizabeth the Queen Mother,		Rooney, J. F. F.—See Page	35
Message from H.M.	109	Rosenbaum, S.—Army Medical Depart-	
Radiography Vehicle, Construction of a		ment Statistics	164
Mass Miniature—R. M. Hector	223	Royal Society International Geophysical	
Radiology, 1948-1958—T. M. Corcoran	162	Year Expedition to Antarctica, The—	
R.A.M.C. Apprentices School—W. A.		R. A. Smart	189
Robinson	175	Salmonellosis in Lizards of Ghana—	
R.A.M.C. Recruits, The Teaching of		E. E. Vella	236
Support Treatment of Mass Casualties		School, The R.A.M.C. Apprentices—	
to—M. J. P. Webster	174	W. A. Robinson	175
Recent Advances in the Transport of		Smart, R. A.—The Royal Society Inter-	
Casualties—R. I. Bodman	179	national Geophysical Year Expedition	
Resection for Tuberculosis in the Army,		to Antarctica	189
Lung—S. E. Large, A. N. Laird and		Snakes and Snake Bite in the Eastern	
G. Kent Harrison	216	Mediterranean Area—Observations on	
REVIEWS :		—J. L. Turk	63
Adams, C. P.—The Design and Con-		Social Services of Cyprus, The Health	
struction of Removable Orthodontic		and—G. F. Neild	51
Appliances	101	Spinal Epidural Infection, Acute—D. D.	
Anscombe, A. R.—Pulmonary Com-		Gibbs	93
plications of Abdominal Surgery	30	Statistics, Army Medical Department—S.	
Blacklock, D. B. and T. Southwell—A		Rosenbaum	164
Guide to Human Parasitology	247	Stephens, K. F.—Anæsthesia, 1948-1958	159
Brompton Hospital Reports. Vol. XXV	101	Stewart, P. D., joint author—See Pate	87
Campbell, E. J. Moran—The Respi-		Stresses in a Military Environment,	
ratory Muscles and the Mechanics		Common—H. L. Freeman	31
of Breathing	247	Support Treatment of Mass Casualties to	
Chamberlain, E. N. —Symptoms and		R.A.M.C. Recruits, The Teaching of—	
Signs in Clinical Medicine	101	M. J. P. Webster	174
Cleave, T. L.—Fat Consumption and		Surgery and the Mau Mau—Wilfred	
Coronary Disease—An Evolutionary		Barber	41
Answer to this Problem	246	Surgery in the Army, A Decade of—J.	
Cleveland, M. (sub editor), See Coates	13	Huston	133
Coates, J. B. J. (editor-in-chief) and		Symposium on Influenza from Western	
Mather Cleveland (editor for Ortho-		Command—	14
pædic Surgery)—Surgery in World		Taylor, G. Gordon—Commemorative	
War II; Orthopedic Surgery in the		Oration on the Occasion of the Dia-	
Mediterranean Theatre of Operations	13	mond Jubilee of the R.A.M.C.	116
Cope, Z.—The Early Diagnosis of the		Tetracycline Hydrochloride in the Treat-	
Acute Abdomen	245	ment of Non-Gonococcal Urethritis	
Kerr, W. G.—Surgery. A Guide to		—R. R. Willcox	44
Surgical Diagnosis and Treatment,		Thornton, J. A.—Treatment of Crush	
including Tropical Surgery (The		Injury of the Chest by Intermittent	
Oxford Handbooks for Medical Auxil-		Positive Pressure Respiration and Con-	
iaries)	103	tinuous Curarisation	226
Le Quesne, L. P.—Fluid Balance in		Toxicity of Intracutaneous T.A.B. Vac-	
Surgical Practice	245	cine, The—A. A. Miles	89

	PAGE		PAGE
Training Centre; The Field—T. M. R. Ahern	168	Unusual Case of Epithelioma Adenoides Cysticum, An—A. R. Pate and P. D. Stewart	87
Training in the French Medical Services, Officer : l'Ecole du Service de Santé—A. V. Nash	27	Urethritis, Tetracycline in the Treatment of Non-Gonococcal — R. R. Willcox	44
Training, The New—D. H. D. Burbridge	171	Vaccine, The Toxicity of Intracutaneous T.A.B.—A. A. Miles	89
Transport of Casualties, Recent Advances in the—R. I. Bodman	179	Val-de-Grâce Church, Hospital, Museum and Medical School—A. N. T. Meneces	22
Treatment of Crush Injury of the Chest by Intermittent Positive Pressure Respiration and Continuous Curarisation—J. A. Thornton	226	Vella, E. E.—Salmonellosis in Lizards of Ghana	236
Treatment of Mass Casualties, Burns—The First Five Days in the—R. J. V. Battle	203	Webster, M. J. P.—The Teaching of Support Treatment of Mass Casualties to R.A.M.C. Recruits	174
Treatment of Non-Gonococcal Urethritis, Tetracycline Hydrochloride in the—R. R. Willcox	44	Western Command, A Symposium on Influenza from—	14
Tuberculosis in the Army, Lung Resection for—S. E. Large, A. N. Laird and G. Kent Harrison	216	Willcox, R. R.—Tetracycline Hydrochloride in the Treatment of Non-Gonococcal Urethritis	44
Turk, J. L.—Observations on Snakes and Snake Bite in the Eastern Mediterranean Area	63	Williams, R. S. and J. A. G. Carmichael, —Ebstein's Disease	238
T.A.B. Vaccine, The Toxicity of Intracutaneous—A. A. Miles	89	Years Between, The—W.A.D. Drummond	112

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CONTENTS

	PAGE		PAGE
ORIGINAL COMMUNICATIONS		A Preliminary Report on Encephalitic Type of Illnesses in Singapore. By Major M. A. C. Dowling, M.B.E., D.P.H., R.A.M.C., and Captain H. E. Webb, M.R.C.P., R.A.M.C.	28
The Practice of Medicine: Past, Present and Future. By Sir Francis Fraser, M.A., M.D., LL.D., F.R.C.P.	1	The Use of Selective Media for the Detection of Beta-Hæmolytic Streptococci. By W. Brumfitt, M.B., M.R.C.P. and P. L. Masters, M.D., D.C.H.	38
Survey of Hæmoglobin Levels of Students attending the Eastern Command Physical Training School. By Captain P. R. Holt, M.B., R.A.M.C.	13	OBITUARY	41
Epidemiological Features of Malayan Leptospirosis. By R. W. Ross Russell, M.D., M.R.C.P.	17	Correspondence—The Romantic Purveyor. By Major-General R. E. Barnsley, C.B., M.C., M.B.	42
Surgical Career in the R.A.M.C.	22	BOOK REVIEWS	44
Case of Bilateral Supracondylar Fracture of the Femur. By Major A. P. Dignan, M.B.E., M.B., F.R.C.S.I., R.A.M.C., and Captain D. J. Reid, M.A., B.M., B.Ch., R.A.M.C.	25	EDITORIAL NOTICES	48

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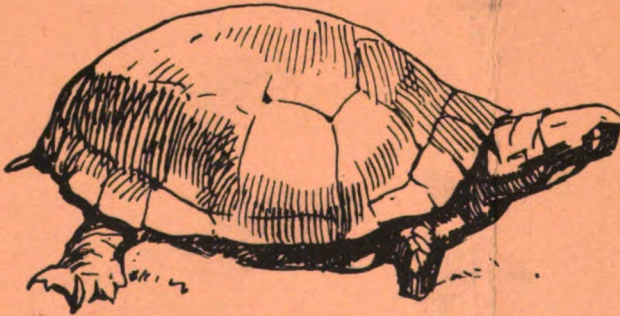
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THE PRACTICE OF MEDICINE : PAST, PRESENT AND FUTURE*

BY

Sir FRANCIS FRASER, M.A., M.D., LL.D., F.R.C.P.

Director, British Postgraduate Federation

As I HAVE always been concerned with medical education and for some years now with postgraduate education in particular, it has been necessary for me to keep thinking ahead and to conjecture what the practice of medicine is likely to involve in the immediate future, in order that medical graduates might be prepared by their education to deal with the changing practice of medicine, and with the changing needs of their patients. That these are changing and changing rapidly is obvious, and if it is impossible to foresee what lies ahead with accuracy an approximation should be possible by a study of the recent past so that the trends can be discerned and so some of the probable developments in the near future.

It is now fifty years since I began my association with clinical medicine and surgery, and although the memory of details is apt to become blurred in that period I still have lecture notes and some of the text-books I used then and these have been useful in checking details. Furthermore, this period has included two world wars in which the best available medical practice was fully utilised to save lives and conserve manpower, and the medical history of the 1914-18 war

* A lecture given at the Royal Army Medical College on Tuesday, 11th February, 1958.

provides a valuable check on one's memory of that time, and I still possess the notes of most of the patients I saw then.

The aim of the clinician was, of course, the same fifty years ago as it is today. In dealing with each individual patient we endeavour to make an accurate diagnosis, to direct treatment, and so to arrive at a prognosis—a prognosis not only as to death or recovery, but more usually as to the patient's ability to continue in gainful employment or to carry out his or her responsibilities whatever these might be, to maintain independence or to be a burden on relatives or the State. In arriving at a prognosis we take the patient's worries and troubles on our own shoulders and we help him to adjust himself to the circumstances arising from his illness. The differences between then and now are in our ability to diagnose and to treat more efficiently and in the changes in the pattern of the community and the social environment, as these affect prognosis.

FIFTY YEARS AGO

In comparison with the present, physical signs as ascertained by clinical examination played a more dominant role in diagnosis in hospital medicine fifty years ago. We had relatively few other methods and our eyes, hands, ears and nose were fully exercised in seeking for signs. The symptoms were indeed important as indications for a diligent search for signs, but without confirmatory signs we were in difficulties. X-ray techniques were in their infancy and were mainly of value in diagnosing fractures and dislocations of bones; there were no contrast media and I cannot recall their use at that time even for pneumonic consolidation or fluid in the pleura. The binaural stethoscope was only just becoming a usual piece of equipment and many of our chiefs still used the wooden monaural tube which fitted snugly into their top hats, and criticised our binaurals as new-fangled instruments that only confused because you heard too much with them and too many extraneous sounds. We tested urines for albumen by boiling with acid and for sugar with Fehling's solution, but these were for the most part qualitative tests only. But we used the microscope constantly and learned much from the microscopy of urine deposits and of fæces. The only real quantitations available to assist in diagnosis were the temperature and pulse charts, the measurement of blood pressure, the red cell and leucocyte counts and the hæmoglobin percentage. In anæmias we relied largely on the microscopic examination of the stained film for diagnosis. Similarly with the cerebro-spinal fluid, its clarity or cloudiness and a stained film of the cellular deposit after centrifuging were useful in the differential diagnosis of tuberculous meningitis and septic conditions. Clinical bacteriology had hardly arrived and most bacteriological diagnoses were made at post-mortem examinations or from specimens removed at operation, though I must make an important exception to this in the case of throat swabs for diphtheria. We became expert in the use of indirect ophthalmoscopy and laryngoscopy using a head mirror and a lamp; the direct vision instruments were not available till some years later but were in use by the time of the 1914-18 war. Test meals had not been invented, though we

used a stomach tube to confirm the diagnosis of pyloric obstruction by the withdrawal of a volume of evil-smelling retained contents. The electrocardiograph had very recently been introduced and a start was being made to sort out the cardiac irregularities. The philosophy of medicine at that time is well illustrated by the advice I received from a revered senior to haunt the post-mortem room and check my physical signs with what I saw there, if I wanted to become a good physician. That is still good advice, but covers only a small part of what we require now of a good physician.

The physical signs disclosed by the physical examination, supplemented perhaps by one of the additional methods I have mentioned, usually sufficed for a tentative diagnosis to be made. Such a diagnosis was but a label corresponding to the heading of a chapter in a text-book which could be consulted if need be to see what the treatment should be, but it gave us no insight into why the patient was ill, what functions of his organs were disturbed and to what extent. There were, of course, cases without physical signs so that no diagnostic label corresponding to an organic disease could be attached, and these we called "functional" to avoid the stigma of saying, what we believed, that their illness was due either to malingering or to some mental weakness which we made no attempt to understand. I will have more to say later about this group of illnesses which now form a relatively much greater proportion of the deviations from health with which we have to deal.

Looking back now on the treatments we so confidently ordered for our patients, there were only a few apart from surgical procedures that really affected the natural history of the disease processes. Iron deficiency anæmias were cured by the administration of iron, myxædema by dried thyroid gland, malaria responded well to quinine and amœbiasis to emetine, rickets to cod-liver oil and scurvy to lime juice, but the development of chemo-therapy and the story of essential foodstuffs and of vitamins had not then really commenced. Some cases of heart-failure responded dramatically to digitalis or strophanthin, but why some did and others did not we did not understand. Antitoxic sera for diphtheria and tetanus were available though not so refined and potent as they are now, and preventive vaccines for typhoid and paratyphoid fevers were to be perfected a few years later at the time of the 1914-18 war. Sodium salicylate seemed to cure acute rheumatic arthritis, then much more prevalent than now. For the great bulk of infectious diseases, including pneumonia and the septicæmias, we could only apply general therapeutic measures. Even surgery was largely limited to the abdomen, to the repair of such conditions as hernias and varicoceles, the treatment of fractures, the traumatic injuries to soft parts, and to the evacuation of pus. Thoracic surgery was unknown except for the draining of empyemata, and neuro-surgery was in its infancy. The excision of neoplasms from the abdomen and pelvis, from bone, from the breasts or from the lip and tongue were usually too late to do more than give temporary relief, and the anæsthetics available were chloroform, open ether and nitrous oxide. We used ethyl chloride spray commonly for local anæsthesia, but novocaine was coming into use for the insertion of needles for draining fluid from the pleura and peri-

cardium. For the remainder, and that included pneumonias, all the infectious diseases, the septicæmias (which were numerous), the anæmias other than iron deficiency, nervous diseases, and the dyspepsias, we busied ourselves with rest, relief from pain, good food, nursing and so-called supportive measures. We relied on fomentations, poultices, aspirin, bromides, opium, morphine, light diet and cathartics, with strychnine in emergencies. We bled in congestive failure, gave frequent subcutaneous salines and sometimes intravenous saline and glucose in collapse, and administered oxygen with a glass funnel suspended near the patient's face. It was a few years later, in the First World War, that blood transfusion was introduced, and even then we knew little about blood groups. We knew enough, however, to carry out a direct match with the bloods of the donor and recipient, but even then it was difficult to find a suitable donor when required, and I recall vividly bleeding a donor into a kidney dish containing citrate and administering the blood to the recipient by pouring it into an open glass funnel attached by tubing to the needle in his vein—but it worked. We exercised our ingenuity in ringing the changes on cough mixtures, prescriptions of alkalis and bitters for dyspepsia and on tonics, and there was a group of preparations called "alteratives," of which arsenic as Fowler's solution was the most important, which were given in the belief that they would correct something we could not define which had gone wrong by some action of which we were ignorant. Fowler's solution was given in pernicious anæmia and leukæmias in this belief.

Since we could so rarely affect the natural process of a disease by our therapeutic measures and knew little or nothing of the disturbances that those diseases were producing in the functions of the body and its organs, and so could do little to correct them, we were usually quite safe in accepting the prognosis which we found recorded in our text-books.

FIFTY YEARS OF PROGRESS

That then is the base line from which the changes of the next fifty years can be assessed. In the years immediately before the outbreak of war in 1914 research was being conducted on so many lines which were later to affect clinical medicine that it is impossible to do more than mention those that impressed me at that time, during which I spent several years in the United States of America. Inspired by the success of the anti-toxic serum for diphtheria, there was an enormous amount of work being done on the bacteriology and immunology of the organisms virulent to man and found in disease. Laboratories for experimental pathology were established and were employed to establish virulence and the relation of organisms to disease, and to determine how the organisms caused disease and death, whether by an exotoxin or by invasion and damage by endotoxin. The studies in immunological responses led to the sub-classification of organisms into types and to a great elaboration of clinical bacteriology. Some of you may recall how the pneumococcus had to be typed in every case of pneumonia, but the only partial success in the production of type specific anti-sera. The

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VOLUME 103

January, 1957—October, 1957



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INDEX TO VOLUME 103

	PAGE		PAGE
Acute Rheumatic Fever, The Use of Sodium Gentisate in—G. Sandler ...	27	Comments on Pulmonary Tuberculosis, A Few—J. Mackay-Dick ...	39
Agglutinins in the West African Soldier, Cold—E. E. Vella ...	203	CORRESPONDENCE:	
Annual Exercise, 1956, Exercise "Medical Deucalion," D.G.A.M.S.—F. M. Richardson ...	127	Barnsley, R. E.—The Unknown Purveyor ...	157
Army Blood Bank in Cyprus, August, 1955–August, 1956, The Development and Organisation of the—J. A. Lunn and J. L. Turk ...	123	Hooker, D.—A Treatment for Athlete's Foot ...	44
Army Medical College, The History of the Royal—the late J. B. Neal ...	163	Ollernshaw, R.—The Contribution of War to the Advancement of Surgery	43
Army Personnel and their Dependents, Surgery in Pulmonary Tuberculosis in—J. Mackay-Dick and S. E. Large ...	85	Cullumbine, H.—The Treatment of Nerve-Gas Poisoning ...	21
Aspects, Mainly Medical, of the Gurkha Recruiting Season, 1955—W. S. Millar	147	Cullumbine, H.—The Toxicity of Screening Smokes ...	119
Autoclave, Some Observations relating to the Sterilisation of Syringes I: by—P. D. Stewart ...	33	Cyprus, August, 1955–August, 1956, The Development and Organisation of the Army Blood Bank in—J. A. Lunn and J. L. Turk ...	123
Bacteriology, Membrane Filters in—L. R. S. MacFarlane and D. Goode ...	67	Cyst Formation following Dermal Graft Herniorrhaphy, Dermoid—W. H. Bexon	42
Barnes, J., joint author. See Caldwell, A. F. ...	91	Davies, H. T.—Intralobar Sequestration of the Lung ...	36
Barnfather, J. L., joint author. See Stewart, P. D. ...	142	Dermoid Cyst Formation Following Dermal Graft Herniorrhaphy—W. H. Bexon ...	42
Battle Casualties, The Resuscitation of—A. J. Clyne ...	1	Deucalion," D.G.A.M.S. Annual Exercise, 1956, Exercise "Medical—F. M. Richardson ...	127
Bexon, W. H.—Dermoid Cyst Formation following Dermal Graft Herniorrhaphy ...	42	Development and Organisation of the Army Blood Bank in Cyprus, August, 1955–August, 1956—J. A. Lunn and J. L. Turk ...	123
Bilharziasis and the 1st (West African) Brigade—C. R. A. Swynnerton. Foreword by Director of Army Health ...	98	D.G.A.M.S. Annual Exercise, 1956, Exercise "Medical Deucalion"—F. M. Richardson ...	127
Bladder, Gunshot Wound of the, An Unusual Case—P. J. Ellis ...	145	EDITORIAL:	
Blood Bank in Cyprus, The Development and Organisation of the Army, August, 1955–August, 1956—J. A. Lunn and J. L. Turk ...	123	Asiatic Influenza ...	207
Brigade, Bilharziasis and the 1st (West African)—C. R. A. Swynnerton. Foreword by Director of Army Health ...	98	Effect of Strenuous Exertion on Women—D. H. Ryde ...	40
Bruce, R.—Impetigo ...	94	Ellis, P. J.—Gunshot Wound of the Bladder—An Unusual Case ...	145
Caldwell, A. F. and J. Barnes—An Occurrence of Toxic Convulsions due to Poisoning with <i>Illicium religiosum</i> ...	91	Elliott, S.—Neutral Red as a Test Reagent in the Chlorination of Water ...	74
49 Cases of Leukæmia occurring in the British Army during the period January, 1947 to December, 1954, A Review of—J. Trevor Hughes and W. B. Thomson	180	Epidemiological Study of Rheumatic Fever in the Army in 1953—S. Rosenbaum and J. D. H. Slater ...	109
84 Cases of Leptospirosis in Malaya, Penicillin in the Treatment of—J. Mackay-Dick and J. F. Robinson ...	186	Exercise "Medical Deucalion"—D.G.A.M.S. Annual Exercise, 1956—F. M. Richardson ...	127
Casualties, The Resuscitation of Battle—A. J. Clyne ...	1	Exertion on Women, The Effect of Strenuous—D. H. Ryde ...	40
Chemotherapy of the Reticuloses—J. B. Harman ...	173	Ex-Services Mental Welfare Society ...	210
Chlorination of Water, Neutral Red as a Test Reagent in the—S. Elliott ...	74	Filters in Bacteriology, Membrane—L. R. S. MacFarlane and D. Goode ...	67
Clyne, A. J.—The Resuscitation of Battle Casualties ...	1	First International Hospital Equipment and Medical Services Exhibition, 1958	209
Cold Agglutinins in the West African Soldier—E. E. Vella ...	203	Gastrectomy for Peptic Ulcer, Partial. A Review of 181 cases among British Military Personnel—R. S. Hunt ...	198
		George Knight Clowes Memorial Prize Essay Competition, 1958 ...	161
		Gold Medal and Trench Gascoigne Prize Essay Competition, 1957 ...	161

	PAGE		PAGE
Goode, D., joint author. <i>See</i> L. R. S. MacFarlane ...	67	MacFarlane, L. R. S. and D. Goode—Membrane Filters in Bacteriology ...	67
Graft Herniorrhaphy. Dermoid Cyst Formation following Dermal—W. H. Bexon ...	42	Mackay-Dick, J. and J. F. Robinson—Penicillin in the Treatment of 84 cases of Leptospirosis in Malaya ...	186
Gryspeerd, M. J.—Stitching with a Hypodermic Needle ...	155	Mackay-Dick, J., and S. E. Large—Surgery in Pulmonary Tuberculosis in Army Personnel and their dependants ...	85
Gunshot Wound of the Bladder—An Unusual Case—P. J. Ellis ...	145	Mackay-Dick, J.—A Few Comments on Pulmonary Tuberculosis ...	39
Gurkha Recruiting Season, 1955, Some Aspects, Mainly Medical of the—W. S. Millar ...	147	Malaya, Penicillin in the Treatment of 84 cases of Leptospirosis in—J. Mackay-Dick and J. F. Robinson ...	186
Hæmatoma of the Larynx, Traumatic—B. Livesey ...	205	Males, Sexual Disorders and Misconduct in Service—H. Pozner ...	51
Hæmoglobin Levels in Recruits and Trained Soldiers—P. D. Stewart, J. R. Yeates, and J. L. Barnfather ...	142	Medical College, The History of the Royal Army—The late J. B. Neal ...	163
Harman, J. B.—Chemotherapy of the Reticuloses ...	173	“Medical Deucalion”—D.G.A.M.S. Annual Exercise, 1956, Exercise—F. M. Richardson ...	127
Health Congress at Folkestone, 1957 ...	208	Membrane Filters in Bacteriology—L. R. S. MacFarlane and D. Goode ...	67
Herniorrhaphy, Dermoid Cyst Formation following Dermal Graft—W. H. Bexon ...	42	Millar, W. S.—Some Aspects, Mainly Medical, of the Gurkha Recruiting Season, 1955 ...	147
History of the Royal Army Medical College—The late J. B. Neal ...	163	Misconduct in Service Males, Sexual Disorders and—H. Pozner ...	51
Hot Air Oven, II: Some Observations relating to the Sterilization of Syringes by the—P. D. Stewart ...	80	Neal, J. B., The late—The History of the Royal Army Medical College ...	163
Hughes, B. W.—An Unusual Case of Rupture of the Uterus ...	156	Needle, Stitching with a Hypodermic—M. J. Gryspeerd ...	155
Hughes, J. Trevor and W. B. Thomson—A Review of 49 cases of Leukæmia occurring in the British Army during the period January, 1947 to December, 1954 ...	180	Nerve-Gas Poisoning, Treatment of—H. Cullumbine ...	21
Hunt, R. S.—Partial Gastectomy for Peptic Ulcer, A Review of 181 cases among British Military Personnel ...	198	Neutral Red as a Test Reagent in the Chlorination of Water—S. Elliott ...	74
Hypodermic Needle, Stitching with a—M. J. Gryspeerd ...	155	Obituary—Sir Lionel Whitby ...	102
<i>Illicium religiosum</i> , An Occurrence of Toxic Convulsions due to Poisoning with—A. F. Caldwell and J. Barnes ...	91	Observations relating to the Sterilization of Syringes, I: by Autoclaving—P. D. Stewart ...	33
Impetigo—R. Bruce ...	94	Observations relating to the Sterilization of Syringes II: by The Hot Air Oven—P. D. Stewart ...	80
The International Workshop ...	208	Occurrence of Toxic Convulsions due to Poisoning with <i>Illicium religiosum</i> —A. F. Caldwell, and J. Barnes ...	91
Intralobar Sequestration of the Lung—H. T. Davies ...	36	Organisation of the Army Blood Bank in Cyprus, August, 1955–August, 1956, The Development and—J. A. Lunn and J. L. Turk ...	123
Large, S. E., joint author. <i>See</i> Mackay-Dick ...	85	Penicillin in the Treatment of 84 cases of Leptospirosis in Malaya—J. Mackay-Dick and J. F. Robinson ...	186
Larynx, Traumatic Hæmatoma of the—B. Livesey ...	205	Peptic Ulcer, Partial Gastrectomy for, A Review of 181 cases among British Military Personnel—R. S. Hunt ...	198
Leptospirosis in Malaya, Penicillin in the Treatment of 84 cases of—J. Mackay-Dick and J. F. Robinson ...	186	Poisoning with <i>Illicium religiosum</i> , An Occurrence of Toxic Convulsions due to—A. F. Caldwell and J. Barnes ...	91
Leukæmia occurring in the British Army during the Period January, 1947 to December, 1954—A Review of 49 cases of—J. Trevor Hughes and W. B. Thomson ...	180	Poisoning, Treatment of Nerve-Gas—H. Cullumbine ...	21
Livesey, B.—Traumatic Hæmatoma of the Larynx ...	205	Pozner, H.—Sexual Disorders and Misconduct in Service Males ...	51
Lung, Intralobar Sequestration of the—H. T. Davies ...	36	Pulmonary Tuberculosis in Army Personnel and their Dependents, Surgery in—J. Mackay-Dick and S. E. Large ...	85
Lunn, J. A. and J. L. Turk—The Development and Organisation of the Army Blood Bank in Cyprus, August, 1955–August, 1956 ...	123	Pulmonary Tuberculosis, A Few Comments on—J. Mackay-Dick ...	39

PAGE	PAGE
Recruits and Trained Soldiers, Hæmo- globin Levels in—P. D. Stewart, J. R. Yeates and J. L. Barnfather ... 142	Turner, G. G., and L. C. Rodgers— Modern Operative Surgery. Vol. II (4th edition) ... 104
Resuscitation of Battle Casualties—A. J. Clyne ... 1	Walker, R. Milnes (joint editor)— See Tidy ... 45
Reticuloses, Chemotherapy of the—J. B. Harman ... 173	Review of 49 cases of Leukæmia occurring in the British Army during the Period January, 1947 to December, 1954— J. Trevor Hughes and W. B. Thomson ... 180
REVIEWS:	Rheumatic Fever in the Army in 1953, An Epidemiological Study of—S. Rosen- baum and J. D. H. Slater ... 109
Bailey, H. (editor)—Pye's Surgical Handicraft ... 206	Rheumatic Fever, The Use of Sodium Gentisate in Acute—G. Sandler ... 27
Bohler, L.—The Treatment of Frac- tures (Translated from the 13th German Edition). Vols. I and II ... 159	Richardson, F. M.—Exercise "Medical Deucalion" — D.G.A.M.S. Annual Exercise, 1956 ... 127
Brompton Hospital Reports. Vol. XXII ... 105	Robinson, J. F.—joint author. See Mackay-Dick, J. ... 186
Buckley, G. L.—X-Ray Reports, Their Importance in a Diagnostic Depart- ment. A Manual for Radiographers and Clerks ... 185	Rosenbaum, S., and J. D. H. Slater—An Epidemiological Study of Rheumatic Fever in the Army in 1953 ... 109
Combes Jnr., J. B. (editor)—Medical Department U.S. Army. Surgery in World War II. Vol. II. General Surgery ... 179	Royal Army Medical College, The History of the—The late J. B. Neal ... 163
Coulter, J. L. S. (editor)—Medical History of the Second World War: The Royal Naval Medical Services. Vol. II. Administration ... 46	Rupture of the Uterus, An Unusual Case —B. W. Hughes ... 156
Crew, F. A. E.—History of the Second World War: The Army Medical Services. Campaigns. Vol I ... 211	Ryde, D. H.—The Effect of Strenuous Exertion on Women ... 40
Ellenbogen, B. K.—joint author. See Miller ... 179	Sandler, G.—The Use of Sodium Gentis- ate in Acute Rheumatic Fever ... 27
Field, J. W., and P. G. Shute—The Microscopic Diagnosis of Human Malaria. Part II. A Morphological Study of the Erythrocytic Parasites ... 159	Screening Smokes, The Toxicity of— H. Cullumbine ... 119
Gillespie, The late R. D., joint author —See Henderson ... 105	Sequestration of the Lung, Intralobar— H. T. Davies ... 36
Hamilton, W. J. (editor)—Textbook of Human Anatomy. Various authors ... 160	Sexual Disorders and Misconduct in Service Males—H. Pozner ... 51
Hansell, P., joint author—See Perkins ... 160	Slater, J. D. H., joint author. See Rosen- baum, S. ... 109
Henderson, D., and the late R. D. Gil- lespie—A Textbook of Psychiatry (8th Edition) ... 105	Smokes, the Toxicity of Screening—H. Cullumbine ... 119
Heuser, G. (joint editor)—See Seyle ... 47	Sodium Gentisate in Acute Rheumatic Fever, The Use of—G. Sandler ... 27
Hill, E. R., joint author—See Rosse ... 104	Some Observations relating to the Sterilisation of Syringes. I: by Auto- claving—P. D. Stewart ... 33
Keating, V., Anæsthetic Accidents ... 185	Some Observations Relating to the Steri- lisation of Syringes. II: By the Hot Air Oven—P. D. Stewart ... 80
Miller, C. H., and B. K. Ellenbogen— A Therapeutic Index. (2nd Edition) ... 179	Sterilisation of Syringes. I: By Auto- claving, Some Observations Relating to the—P. D. Stewart ... 33
Oughterson, A. W. (editor), and W. Shields (joint editor)—Medical Effects of the Atomic Bomb in Japan ... 179	Sterilisation of Syringes, II: By the Hot Air Oven, Some Observations relating to the,—P. D. Stewart ... 80
Perkins, E. S., and P. Hansell—An Atlas of Diseases of the Eye ... 160	Stewart, P. D., J. R. Yeates and J. L. Barnfather—Hæmoglobin Levels in Recruits and Trained Soldiers ... 142
Pryor, W. J.—A Manual of Anæsthetic Techniques ... 45	Stewart, P. D.—Some Observations relat- ing to the Sterilisation of Syringes. I: By Autoclaving ... 33
Psychiatry and Religion. M.D. Inter- national Symposia No. 3 ... 105	Stewart, P. D.—Some Observations relat- ing to the Sterilisation of Syringes. II: By Hot Air Oven ... 80
Roche, A. E.—Practical Urology ... 104	Stitching with a Hypodermic Needle— M. J. Gryspeerdt ... 155
Rodgers, L. C., joint author—See Turner ... 104	Strenuous Exertion on Women, The Effect of—D. H. Ryde ... 40
Rosse, The Earl of, and E. R. Hill— The Story of the Guards Armoured Division ... 104	Study of Rheumatic Fever in the Army in 1953, An Epidemiological—S. Rosen- baum and J. D. H. Slater ... 109
Seyle, H., and G. Heuser (editors)—The Fifth Annual Report on Stress, 1955 ... 47	
Shields, W., (joint editor). See Oughter- son ... 179	
Shute, P. G., joint author. See Field ... 159	
Tidy, H., and R. Milnes Walker (joint editors), The Medical Annual, 1955 ... 45	

	PAGE		PAGE
Surgery in Pulmonary Tuberculosis in Army Personnel and their Dependants—J. Mackay-Dick and S. E. Large ...	85	Tuberculosis in Army Personnel and their Dependants, Surgery in Pulmonary—J. Mackay-Dick and S. E. Large ...	85
Swynnerton, C. R. A., with Foreword by Director of Army Health—Bilharziasis and the 1st (West African) Brigade ...	98	Turk, J. L., joint author. <i>See</i> Lunn, J. A.	123
Syringes, Some Observations relating to the Sterilization of, I: By Autoclaving—P. D. Stewart ...	33	Ulcer, Partial Gastrectomy for Peptic—A Review of 181 cases among British Military Personnel—R. S. Hunt ...	198
Syringes, Some Observations relating to the Sterilisation of, II: By the Hot Air Oven—P. D. Stewart ...	80	Unusual Case of Rupture of the Uterus—B. W. Hughes ...	156
Test Reagent in the Chlorination of Water, Neutral Red—S. Elliott ...	74	Unusual Case, Gunshot Wound of the Bladder, An—P. J. Ellis ...	145
Thomson, W. B., joint author— <i>See</i> Hughes, J. Trevor ...	180	Use of Sodium Gentisate in Acute Rheumatic Fever—G. Sandler ...	27
Toxicity of Screening Smokes—H. Cullumbine ...	119	Uterus, An Unusual Case, Rupture of the—B. W. Hughes ...	156
Toxic Convulsions due to Poisoning with <i>Illicium religiosum</i> , An Occurrence of—A. F. Caldwell and J. Barnes ...	91	Vella, E. E.—Cold Agglutinins in the West African Soldier ...	203
Trained Soldiers, Hæmoglobin Levels in Recruits and—P. D. Stewart, J. R. Yeates and J. L. Barnfather ...	142	Water, Neutral Red as a Test Reagent in the Chlorination of—S. Elliott ...	74
Traumatic Hæmatoma of the Larynx—B. Livesey ...	205	(West African) Brigade, Bilharziasis and the 1st—C. R. A. Swynnerton ...	98
Treatment of Nerve-Gas Poisoning—H. Cullumbine ...	21	West African Soldier, Cold Agglutinins in the—E. E. Vella ...	203
Treatment of 84 cases of Leptospirosis in Malaya, Penicillin in the—J. Mackay-Dick and J. F. Robinson ...	186	Women, The Effect of Strenuous Exertion on—D. H. Ryde ...	40
Tuberculosis, A Few Comments on Pulmonary—J. Mackay-Dick ...	39	Wound of the Bladder, Gunshot—An Unusual Case—P. J. Ellis ...	145
		Yeates, J. R., joint author. <i>See</i> Stewart, P. D. ...	42

classification of streptococci into virulent and avirulent types and the sub-classification of the virulent ones occupied many laboratories and much time, and the same applied to several other organisms. This search for potent anti-bacterial and anti-toxic sera continued between the wars and only ceased with the discovery of the sulphonamides and penicillin just before the beginning of World War II. The prevention of acute infections by means of vaccines was being actively pursued at the same time, stimulated largely by the success of T.A.B. vaccine, the value of which was finally established by the experience gained in the 1914-18 war. This has been followed by the success of the preventive inoculations of diphtheria and tetanus toxoids, and is, as you know, still being pursued for whooping cough, tuberculosis, poliomyelitis and influenza.

The other important event of the pre-1914 years was the introduction of salvarsan for the treatment of syphilis. The discovery of a potent remedy always leads to research on new lines and to important new knowledge of the disease processes concerned. In this case certainly, the experimental pathologists, the immunologists, the histologists, the biochemists, the pure chemists and the industrial chemists found clues for new lines of research and the clinician gained a clearer conception of the body's reactions to chronic infections. It stimulated directly a search for compounds that could be used therapeutically in other spirochætal and in protozoal and other infections, such as the antimony compounds in leishmaniasis, arsenicals in trypanosomiasis and chaulmoogra oils in leprosy. It led also to statistically controlled therapeutic trials, to familiarity with the intravenous and intrathecal routes for drug administration, and a greater precision in the dosage of potent remedies.

The 1914-18 war taught many lessons, but perhaps the most far-reaching, apart from the terrors of sepsis and the importance of personal cleanliness and of general hygienic measures, was that many persons are unable to stand up to severe physical and mental stress without suffering from any recognisable disease. In other words, health is a relative term. This led to the investigation of the normal requirements in nutrition and other conditions in order to maintain maximum efficiency. The physiologists had been studying in animals the normal functions of organs quantitatively and had established for many of them the ranges within which no abnormality could be said to exist, but little of this information had been applied to clinical medicine, and quantitations of functions in health and disease in man were scanty. As I pointed out earlier, in the first decades of the century the only quantitative examinations commonly carried out in the examination of patients were the temperature, pulse rate, blood pressure, red and white blood cell counts and hæmoglobin percentages. The immediate post-war years were marked by the growing application of quantitative methods and of advances in physiology to the study of diseased persons. Physical signs remained as important as ever, but in addition the need to assess quantitatively the alteration of function was recognised in order to ascertain the reasons for ill-health or the impairment of fitness. Before the war, clinicians had recognised that they required a knowledge of the physiology of the heart-beat in order to assess the significance of cardiac irregularities and that the electrocardiograph

was a necessity in an efficient hospital, but after the war it was the biochemical aspects of physiology that were increasingly applied in the investigation and treatment of patients. If I may again illustrate the change that was then taking place in clinical practice by referring to my own experience, before the war Sir Archibald Garrod had shown that alkaptonuria was due to a broken link in the metabolic chemical chain. This is a rare condition and the lesion is genetically determined; the general application of his investigations was not at the time realised, and I certainly failed to see their significance both as to the coming importance of biochemistry in clinical medicine and of genetically determined abnormalities. Then a few years later, after the war, came the discovery by Banting and Best of insulin and its part in the cause of diabetes mellitus and its value in treatment, so that the diabetic could lead a long and useful life—a spectacular change from the prognosis of pre-insulin days. This discovery led to the quantitative estimations in patients of urinary and blood sugar, and of hydrogen-ion concentration and carbon-dioxide content and capacity of the blood, and to their variations under the differing conditions met with in health. At about the same time the development of thyroid surgery made it necessary to determine basal metabolic rates in order to establish quantitatively the excessive or deficient secretory activity of the thyroid gland. Doubtless other observers would quote other events that in their experience marked the commencement of a new era in clinical practice—that of accurate estimation of functions in order to diagnose not merely a disease process, but the reactions of the body to the external or internal environment, in order that it might be assisted in its efforts to adjust and maintain general efficiency. We are still in that era and not a day goes by without the biochemists shedding more light on the processes by which health is maintained. More recently they have been joined by the biophysicists whose assistance is required to unravel the problem of sources of energy required for the biochemical reactions to take place and the storage of the energy that may result from them, and their micro-electrical techniques are adding to knowledge in many directions, especially in the functions of the nervous system.

The biochemists are disclosing the long chain of reactions that must take place for the conversion of proteins, fats, carbohydrates, salts and water of foods into the protoplasm of living cells and the constituents of the body fluids, and for their catabolism and excretion, reactions that require the presence of enzymes, co-enzymes and substrates at the right time and place. Into this pattern they are fitting the hormones and vitamins and other essential foodstuffs, without which the chain of reactions will be broken at some stage with perhaps serious or quite minor effects on the efficient functioning of the body as a whole. With the help of the biophysicists the physical nature and location of these reagents are being determined. X-rays, radio-isotopes and such inventions as the electron microscope are their new tools and they think now in terms of the shapes and physical relations of the individual molecules, for these determine the physical and chemical properties of the constituents and products of cells. The enzyme pattern appears to be determined by the chromosomes and their genes, so that the anatomy of the individual cell and the chemistry of its constitu-

ent particles are becoming the objects of their studies. Already the clinician has, in consequence, a much better understanding of protein, and of salt and water metabolism, of how to direct treatment to correct disturbances and of how to avoid methods of treatment that upset the balance of water, sodium and potassium and so do more harm than good. There is little doubt that many more practical clinical advances both in diagnosis and treatment will result from the new basic knowledge that is being established and will continue to be acquired for many years to come.

The years immediately preceding World War II saw the discovery of the sulphonamides and of penicillin, but it was during the war that the clinical use of penicillin was established. As a result, by its means and by the other antibiotics that have since been elaborated, infections due to bacteria have been controlled, though so far we cannot affect virus infections. As is usual following a new discovery of such importance, the basic sciences have acquired a new tool, bacteriology has become microbiology, and in endeavouring to establish how these substances act the microbiologists have shown that, in the case of some at least of the antibiotics, their action is due to their successfully competing with enzymes or co-enzymes necessary for the growth of the bacterium. Resistant strains result from mutations that avoid the particular step in the metabolism of the organism with which the antibiotic interferes. Here again we find the new knowledge emphasising the importance to medicine of biochemistry, biophysics and genetics and to the need for an understanding of these sciences in order to advance our knowledge still further.

Among many forms of treatment that were advanced under the urgencies of World War II I must refer to blood transfusion. The provision of donors, the grouping of donors, the preservation of blood and its constituents and their administration to patients required skilled staff and an elaborate organisation. It led also to investigations into the factors responsible for the different groups and their determination genetically. From it arose also important investigations into the clotting mechanisms, and although this story is not yet complete it also already points to a chain of enzyme and co-enzyme regulated reactions and to the occurrence of genetically determined faults in the chain. It has led also to new diagnostic methods not only of value in the elucidation and treatment of the various kinds of "bleeders," but also necessary for the control of treatment by anti-coagulants in patients with intra-vascular thrombosis.

These are but a few examples of the great increase since the beginning of the century in the methods of diagnosis and treatment available in the practice of clinical medicine and offering a much deeper and clearer understanding of health and of ill-health and of the methods by which our patients can be helped, but I have so far made no mention of the advances in surgery. Largely due to the improvements in anæsthesia and the researches on anoxia, hypercapnia, relaxants and hypothermia, and to a better understanding of shock, its prevention and treatment, the surgeon has been able to operate successfully on regions of the body that were impossible fifty years ago, such as the central nervous system and the thorax. In the latter area he now resects lobes or the whole of one lung and

opens the heart in order to repair abnormalities of the valves and septa, but in order to do so successfully he requires extremely accurate diagnosis both of the position and extent of the lesion and the functional impairment of the respiratory apparatus or of the circulation as the case may be. These have necessitated the development of new quantitative methods of investigation for determining normal ranges and the departures from these in pulmonary ventilation, blood gas contents and capacity, blood volume and rates of flow, all requiring considerable knowledge of physical chemistry. The localisation and determination of the extent of the lesions would not have become possible if the use of contrast media and considerable improvements in radiological technique had not been developed by the physicists.

Social medicine. I have tried so far to present to you a very general view of the developments that have taken place and are still taking place in the basic medical sciences and their effects on the practice of medicine, but mainly in their applications to curative medicine or the diagnosis and treatment of sick persons. Great changes have occurred also in preventive and in community or social medicine. The two world wars, and especially the second, brought to light many distressing conditions affecting the health and well-being of man. For example, the evacuation of mothers and children from the threatened cities of this country disclosed that we had in our midst numbers of dirty, under-nourished and often vermin-infested persons with low standards of physical, intellectual and moral health. The need for food rationing in this country and the plight of the refugees in Western Europe at the end of the war required the determination of minimal dietetic requirements to provide a yard-stick for the assessment of under-nourishment. As a result of such investigations the State now subsidises food-stuffs, and provides extra nourishment for pregnant and nursing mothers and their infants, and subsidises meals for school children. The urgent need for manpower during the war and the full employment since the war have given us a new conception of health and of convalescence. Convalescence is now regarded as a period of active restoration to fitness or of preparation for a new form of employment. These are but two aspects of the provisions of the Ministry of Health and the Ministry of Labour to improve and maintain health and to enable each person to make the best possible contribution to the community. Other examples of the measures adopted by the Welfare State that affect the practice of medicine indirectly are housing subsidies, free education, holidays with pay, and so on. That all these expensive commitments are in fact producing a comparable return in a healthier, happier and more efficient nation is not yet proven, and in a recent address to Birkbeck College Lord Woolton pleaded for an assessment of the results by sociologists, anthropologists, psychologists and others.

The local authorities now provide, in addition to ordinary public health measures, a wide range of services that, if fully used, are valuable aids to the clinician. The Tuberculosis Service of the London County Council, for example, provides special health visitors, home helps, recuperative holidays, open air schools, B.C.G. vaccination and mass radiography. Their School Health Service

provides audiometry, testing of vision, special arrangements for the physically or psychiatrically handicapped child and dental treatment ; and other services include maternity and child welfare, home nursing, domestic helps and meals-on-wheels for old persons, and immunisation against diphtheria, whooping cough and smallpox.

This development and the provision of such services by the State and local authorities in order to prevent ill-health and to improve the physical well-being and happiness of the people is a characteristic of the past few years, and it is doubtful if they are being utilised fully yet by the clinicians. Clinicians, whether consultants, specialists or family doctors, are often individualists, and it is only when they learn to co-operate fully with the medical officers of health and to make full use of the community services and the specialised knowledge of the medical officers that these advances and doubtless others to come will produce the improvements they are designed to effect.

Genetics. I have referred more than once this evening to genetics and would like to discuss briefly this science, for it has been advanced greatly in the past few years and is likely to affect our conceptions of health and ill-health and the practice of medicine considerably in the future. The simple Mendelian conception of heredity no longer suffices, largely through the experimental production of mutations in plants, bacteria, insects, etc., in which the generation-time is so much shorter than in man. By analogy with these simpler organisms, however, we conceive each individual human being as resulting from the influences of his inherited genes (of which he has several thousands) and of the environment in which he has developed. We believe also that the influence of any one gene is affected by a number of other genes and that any characteristic is the outcome of a combination of genes, any one of which may have little influence independent of other genes and of the environment. Mutations are probably of frequent occurrence, but a single mutant gene may produce no discernible effects unless the environment or other genetic mutations act in conjunction with it. It is probable that I have, for the sake of brevity, over-simplified the story beyond what the ascertained facts justify, but it is clear that the new knowledge acquired by the geneticists offers a very much wider conception of the influence of inherited factors on health and on the etiology of deviations from health, for the formation of enzymes, enzyme inhibitors, co-enzymes, antigens and antibodies is under gene control, and minor variations in development and metabolism, and in susceptibility or resistance to infections and to stress, can be conceived as the result of the joint action of the genotype and the environment. By the study of pedigrees, more human diseases are being recognised as due to a dominant or a recessive mutant gene, and the methods now employed to recognise the presence of the recessive genes in the heterozygotes of sickle-cell anæmia and of thalassæmia are promising for the future. Abnormal genes cannot be excised, but the avoidance of the lesion by excluding from the diet the substance that is not being metabolised normally, as in galactosæmia and phenylketonuria, or by correcting the abnormal step as in the use of vitamin C in methæmoglobinæmia, are examples of how the new knowledge can lead to effective clinical treat-

ment. I believe that there is much more to come from the science of genetics, apart from any control of marriage between individuals who are carriers of the same recessive gene, which would prove extremely difficult in practice.

Stress disorders. It may be because of the great advances in the basic sciences and their successful application by clinicians to the diagnosis and treatment of the causes of disease and ill-health that clinicians are increasingly conscious of a group of patients variously estimated as forming 20 to 25 per cent of general practice, the precise causes of whose symptoms are difficult to decide. These are the cases labelled "functional" fifty years ago and now called "stress disorders" or "psychosomatic." It may be that they have really increased in numbers, due perhaps to the changing social conditions, the loss of class distinctions, of family life and religion that formerly offered rules and standards of behaviour and guidance in the relations of the individual with his fellows or his relatives. Certainly fifty years ago the patient with this type of disorder was left for treatment to the wise uncle or aunt, to the parson or to the sibs in the usual large families of those days. It may be partly also the result of full employment under the Welfare State that minor disabilities due to worries and frustrations are now coming within the purview of the registered medical practitioner more than in the past. Only a few of these patients require the special skills and experience of the psychiatrist, and physicians and family doctors are seeking instructions and guidance in their management, for not only may the disability be due entirely to psychogenic causes, but cases of organic disease are very frequently complicated by psychological factors. The general physician, but above all the family doctor, is in the best position to help, with his knowledge of the conditions at home and at work and of the personalities of the patient and of those with whom he is in contact. To track down the cause, to eliminate it or to assist the patient to adjust successfully to the adverse conditions or persons constitute as satisfactory an exercise in diagnosis, treatment and prognosis, as any in medicine, but they require time and above all human sympathy, compassion, patience and a determination to help. Some clinicians seem to be able to manage these cases successfully with little instruction other than the example of their seniors, but the majority appear to require more guidance and teaching than they have received in the past, either in their undergraduate or postgraduate years.

THE FUTURE

I hope that this brief and extremely superficial and selective account of the changes that have occurred in the past fifty years in the practice of medicine will suffice to indicate the direction of present trends in order that we can make an intelligent guess at the further changes that are likely to occur in the next few decades. It seems certain, in the first place, that the biologists and physiologists, especially the biochemists, the biophysicists and the microbiologists, will continue to make important advances in our knowledge of the minute structures of which the human body is composed and of their functions. It will be the duty of the clinical consultants and especially those in teaching hospitals

to apply this knowledge for the purposes of diagnosis and treatment, and for this they will require a better knowledge of biochemistry and biophysics and of statistical methods than they in general have at present. They alone have the laboratories and technical services necessary. In due course such new methods of proven value to clinical medicine are usually greatly simplified and become available to domiciliary medicine, or the laboratory results can be correlated sufficiently with symptoms and signs that domiciliary medicine is enabled to make use of the new basic knowledge. We have seen this happen to a considerable extent in the management for example of diabetes mellitus, of hypo- or hyperthyroidism, and of œdema. But if the family doctors are to reap the benefits of these new methods and knowledge for patients in general practice, they too must have at least an understanding of the principles and the modern language of the biochemist and biophysicist and realise the importance of accurate measurements and controlled observations. There seems little doubt that they will be called upon to apply new knowledge to an increasing extent in, for example, the continuing management and treatment of their patients after discharge from hospital, as we already see in their use of powerful and potentially harmful hypotensive drugs, antibiotics, anticoagulants, diuretics, relaxants, synthetic hormones and so on.

I have said little about the nervous system largely because there have been few developments so far that have altered radically the therapeutics and prognoses of the diseases of this system, apart from surgical treatment. The methods of biochemistry, biophysics and pharmacology are being vigorously applied here also, and the demonstration of the chemical transmission of nervous impulses and the blocking of impulses in the involuntary nervous system have already affected clinical medicine and anæsthesia, but this is almost certainly only a beginning and a knowledge of the principles will be a necessity for all clinicians in the future. It is always rash to prophesy, but it is not improbable that we will soon have a rational basis for the mounting evidence that emotions and other mental activities can not only disturb the functions of the body and its organs, including the female pelvic organs, but result in structural changes such as peptic ulcer and ulcerative colitis. Elucidation of the processes involved would soon lead to therapeutic measures based on scientific principles in place of the present empirical methods, successful though these sometimes are. As I pointed out earlier, the majority of these cases of psychogenic origin or complication do not require the special experience of psychiatrists for their treatment, and the family doctor is more favourably situated to track down the causal factors and help the patient to overcome them. If their diagnosis and treatment should, as I am suggesting, become rationalised, the family doctor will be in a still stronger position to deal with this increasing form of ill-health.

Finally there is the trend towards preventive medicine and to measures designed to raise the physical and mental standards of man. The past few decades have seen increasing action by the State to initiate measures for this purpose, as sound evidence is accumulated to show the standards to be aimed at and how they can be attained. Progress may be slow and the evidence on which

action should be based is only slowly being collected, but the rates of progress have been increasing and there seems little doubt that the next few decades will see advances in this aspect of the work of the medical profession. I have mentioned already the provisions now made by local health authorities, and in this field the medical officers of health, from the smallest local authority to the officers of the Ministry of Health, school medical officers, industrial medical officers, and the officers of the Ministry of Labour are the specialists. The clinicians, whether consultants or general practitioners, must know more about this field of medicine if they are to obtain the maximum benefits for their patients, but only the family doctor can be aware of the many aspects of occupational and environmental hygiene and of the social conditions that can so powerfully affect health and happiness, and he alone can guide those in his care through all the hazards of childhood and adolescence—these critical periods in development—and help each adult to adjust him or herself to the personal environment in order that he or she may make their contribution to the well-being of the community. There is no such thing as a normal man or woman; each is the product of inherited genes and the environment, and if the former cannot yet be controlled the latter can to an increasing extent, and the family doctor alone can have the facts and he alone is in the position to use the increasing knowledge of all the experts and to enlist their aid.

SUMMARY

I have wandered along many paths and rather vaguely in the course of this discussion, but clinical practice in the near future will certainly be influenced by the present trends and out of these certain features emerge more clearly than others. These seem to me to be :

1. New knowledge and new methods will continue to be developed by physiologists, pharmacologists, biochemists and biophysicists which will be applied increasingly to clinical medicine. This application will be made by clinical specialists and consultants in teaching hospitals with their laboratories and technical assistance, and later simplified and adapted for domiciliary medicine. Clinicians, whether consultants or family doctors, must therefore understand the new principles and new terms that are being developed in these biological sciences which now deal more and more with the infinitely small.

2. As the major diseases come under control, minor disturbances of health and fitness will become increasingly the concern of clinical practice. All clinicians will need to pay increasing attention to the importance of genetics and of the influence of emotions and mental activities on health and physical fitness, and it will be for the family doctor in particular to diagnose and treat the patients with these minor disorders.

3. Prevention of disease and raising the standard of physical and mental health of man will become more important relatively to curative medicine. The community medical services, maternity and child welfare, industrial, occupational and environmental hygiene are in a phase of active development, and

clinicians will need to co-operate increasingly with the public health officers in order to reap the full benefits of these services. They are the specialists in this branch of medicine, and to them the family doctor must turn for help and advice in the same way as he turns to clinical specialists for help in diagnosis and treatment. In order to do this effectively he must keep in touch with the new methods of prevention and the means of raising standards of fitness.

4. The conclusion seems inescapable that, in order that the medical profession may pass on the benefits of the increasing advances of medical science to the people, the work of the family doctor will become more not less important, and he must be educated in the new principles and concepts not only of curative medicine but also of preventive medicine and positive health measures, and that of all members of the medical profession he has before him the prospect of a career that will bring increasing opportunities for service to the nation and mankind.

A SURVEY OF HÆMOGLOBIN LEVELS OF STUDENTS ATTENDING THE EASTERN COMMAND PHYSICAL TRAINING SCHOOL

BY

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UNTIL recently, idiopathic hypochromic anæmia was generally regarded as a disease of women, and in their extensive bibliography Wintrobe & Beebe (1933) could discover in the literature only 18 cases in males of all ages, out of which 5 had developed anæmia following gastric operations. Witts & Burgher (1934) published a series of 24 cases in adult males of which 8 were under 30 years of age, only one showing achlorhydria, while the remaining 16 patients were all aged 40 and over and suffered from gastric disturbances. Britton (1936) classified the anæmias present in 183 unselected patients in all age groups and found only 4 men in which the cause could not be decided.

In 1943 the Medical Research Council conducted a survey of hæmoglobin levels in this country covering men mainly in reserved occupations (M.R.C. Special Report Series No. 252, 1945). This showed that the average level of hæmoglobin in working men under 20 years of age was 15 g. per cent and between 20 and 40, 15.1 g. per cent. Of the whole survey and at all ages 2.5 per cent of males had results under 12.6 g. and 0.9 per cent were under 11.85 g. They noted that these figures included numerous agricultural workers in whom

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the average percentage was rather low. In the same survey, among 990 Canadian Base troops, only one man had a hæmoglobin level below 12.6 g. per cent and the overall average was 16.1 g.

Shorthouse & King (1951) investigated 20 cases of hypochromic anæmia in young soldiers seen at the Cambridge Military Hospital over a period of two years, while Leonard (1954) surveyed 4,221 Royal Air Force recruits, discovering 47 cases below 12 g. per cent in which no cause could be found, and of these 37 were under 10.5 g.

The present investigation follows the survey by Stewart, Yeates & Barnfather (1957) of normal Army recruits and is written to emphasise the large number of recruits with anæmia and takes into account some of the factors that may bring a man under the care of a Command Physical Training School.

For a number of years the Home Counties District Laboratory has performed routine hæmoglobin investigations on all entrants to the Eastern Command Physical Training School at Shorncliffe. The results of these investigations since 1954 have been collected, a graphical report of the figures produced and some comparison made with reported results on normal fit young men.

Of the soldiers sent to the Physical Training School since early 1954, over 97 per cent consisted of recruits from Eastern Command depots in their first six weeks of training who were considered likely to benefit from an intensive physical development course. The majority were men who were over-weight or under-weight, and the remainder had failed at various stages of their recruit training. They had all been given a full physical examination either by civilian or service medical boards before and on entry to the Army, and the greater number were examined again before recommendation for the course. The few who were not recruits were generally sent to the School by Guards regiments as not being up to the high standard they required, and these also had undergone a recent medical examination.

METHOD

Capillary blood was taken in each case between 2 and 4 p.m., using the standard issue 20 cu. mm. hæmoglobin pipette. Unfortunately the method of estimating hæmoglobin was not standardised throughout the investigation, although since December, 1954, over 500 specimens have been examined using an M.R.C. Grey Wedge photometer to estimate oxyhæmoglobin converted by the use of 0.04 per cent ammonia in distilled water. Between January and December, 1954, some estimations were made using oxyhæmoglobin read in an E.E.L. photo-electric colorimeter.

RESULTS

The results have been recorded in terms of the percentage of hæmoglobin (100 per cent=14.8 g. per cent) and are shown graphically in Figure 1. 732 estimations were available for survey, covering a period from January, 1954 to October, 1956. The mean hæmoglobin value obtained was 93 per cent (13.8 g.

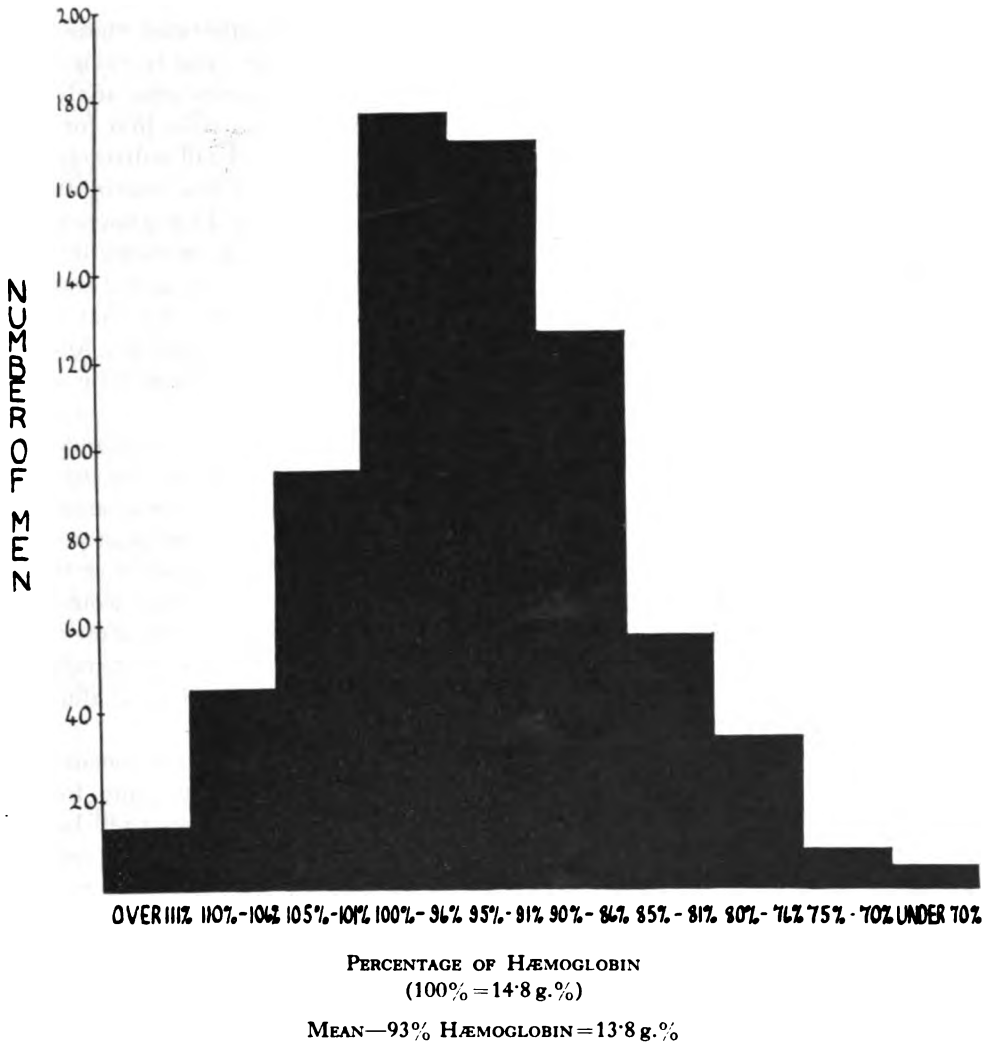


Fig. 1. Histogram of routine hæmoglobin estimations performed on men on the Eastern Command Physical Training School course. January, 1954—October, 1956

per cent) with extremes of 55 to 117 per cent (8.2 to 17.4 g. per cent). 103 men (14 per cent of the total) showed values below 12.6 g. per cent and 12 men below 11.1 g. per cent.

DISCUSSION

The mean hæmoglobin in young male adults has been calculated on a number of occasions and the results have been reviewed by Stewart *et al.*, (1957) who added estimations on 229 Army recruits and found a mean value of 15.3 g. per cent.

This present survey was made on men who had been selected for physical

training because they were below general standard although otherwise medically fit. Each man had been passed fit before entry to the Army and was re-examined afterwards during his first week of training. Before these figures were analysed it was considered likely that the mean would be slightly lower than that for the general population, and in addition a small proportion would fall substantially below the standard deviation at the lower end of the scale. These assumptions have been borne out by the results obtained, but the mean of 13.8 g. per cent, which is 1.5 g. per cent below that calculated by Stewart *et al.*, is considerably lower than would have been originally estimated. That this result is not due to unfair weighting by abnormally low figures is illustrated by the fact that only four men (0.55 per cent) had results below 10.4 g. per cent, of which the lowest was 8.2 g., and if these four results were rejected the mean would still be only 13.9 g. per cent.

It is unfortunate that the method of estimating hæmoglobin was not standardised throughout the investigation, but McFarlane (1951) states that for general use the M.R.C. Grey Wedge photometer measuring oxyhæmoglobin was accurate with a coefficient of variation of 4.3 per cent, while the photoelectric photometer is said to have a variation of about 5 per cent. It has been assumed that these variables cannot have materially influenced the result and any errors would be balanced over 732 estimations. All estimations were performed at the same time of day over the whole period, McCarthy & Van Slyke (1939) and Stemgle & Schade (1957) having demonstrated the occurrence of a physiological diurnal variation of hæmoglobin of about 10 per cent.

Leonard (1954) in his series of over 4,000 Royal Air Force recruits considered a hæmoglobin level of under 12 g. as suggesting definite anæmia and found 1.2 per cent below this figure. In this series 46 men (6.3 per cent) fell below Leonard's level, but it is suggested that 12.6 g. should be regarded as the critical figure below which a man cannot be expected to perform adequately his recruit training and subsequent duties. During the period of this investigation 77,000 men commenced their recruit training in Eastern Command Depots, so that approximately 1 per cent were sent to the Physical Training School, and of these 14 per cent were found to be anæmic.

It may be assumed that no more than 30 per cent of men suffering from anæmia will be sent to a physical development course, so that probably 0.5 per cent of all recruits have a hæmoglobin level below 12.6 g. per cent, which agrees with the findings of Stewart *et al.*

No attempt has been made in this paper to assess the cause of the anæmia in each case, but the general impression gained is that the majority were idiopathic hypochromic in type. This conforms to the observations of Leonard (1954), who found after exhaustive investigation that in 94 per cent of his cases no cause could be discovered.

These results emphasise the importance of regular hæmatological screening of all pupils at Physical Training Schools and, in addition, indicates that a recruit may suffer from hypochromic anæmia of significant degree which will impair his general capacity.

SUMMARY

The hæmoglobin levels of 732 students at Eastern Command Physical Training School were analysed and a surprisingly high proportion of men were found to have mild anæmia.

Some comparison with published figures is made.

I should like to thank Lieut.-Colonel P. D. Stewart, R.A.M.C., for encouragement, and Mr. S. Rosenbaum, M.A. (A.M.D. Statistics), for statistical information.

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EPIDEMIOLOGICAL FEATURES OF MALAYAN LEPTOSPIROSIS

BY

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THE recent occurrence of leptospirosis in troops engaged against the Chinese Communists in the Malayan jungle has stimulated interest in the disease, and reports have appeared dealing with diagnosis and treatment (Fairburn & Semple, 1956; Trimble, 1957; Mackay-Dick & Robinson, 1957). The importance of preventive measures must not be overlooked, however, since no one therapeutic agent is universally regarded as effective.

Epidemiological data collected from 64 consecutive cases of leptospirosis in a Malayan military hospital are presented below. The infection was mild, and only eight cases were jaundiced. All cases were proved by blood culture or serological means.

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Table 1. *Epidemiological details in 64 cases covering the period of 3 weeks before admission*

<i>Total number admitted from primary jungle</i>				42
History of drinking untreated water	...	...	...	4
Noticed proximity of rats	...	...	...	2
Jungle sores on admission	...	...	...	24
No special features	...	...	...	12
<i>Total number admitted from jungle edge, swamps, etc.</i>				16
History of drinking untreated water	...	...	...	2
History of swimming in rivers near jungle	...	...	...	9
No special features	...	...	...	5
<i>No jungle operations or contact with water</i>				6
				<u>64</u>

RESULTS

The patients in the present series were all adult males with ages varying from 18 to 36, the average being 21.5 years.

Forty-nine cases were British, 11 Gurkha, and 4 Malayan. Approximately equal numbers of British and Gurkha troops were engaged in jungle operations in the area served by the hospital. The number of Malay troops was variable, and some of them were admitted to civilian rather than to military hospitals.

Table 1 shows the epidemiological data collected from patients on admission. Only in six patients could no relation be traced to the jungle, to water or to swimming.

The majority of patients came from operations in primary jungle, where they were exposed continuously to conditions of heat and extreme humidity for periods of 1-2 weeks. Rivers and small streams were frequently crossed during patrol work, and long periods were sometimes spent with the legs immersed in stagnant swamp water.

Scrub, secondary jungle and paddy-fields are even wetter than primary jungle, and 16 patients contracted the disease under these conditions. Nine cases had been swimming in pools or rivers near the jungle. The importance of damp conditions is further emphasised in Fig. 1, which shows the numbers of admissions of confirmed cases of leptospirosis to Taiping hospital over the period April, 1955, to June, 1956. The greatest incidence is seen to occur in October, 1955, at the time of the heavy rains.

The finding of jungle sores in 24 out of the 42 cases admitted from the primary jungle (57 per cent) may be important in indicating the route by which infection occurred, although unfortunately no figures were collected on the incidence of jungle sores in healthy troops.

Softening and infection of the skin were frequently produced by the wearing of the standard canvas rubber-soled jungle boots, by infrequent changing of socks, and by the lack of opportunity for washing and drying the feet.

Four patients from the jungle confessed to drinking untreated water, and infection by the alimentary tract in these cases cannot be excluded. This remark

applies also to those who were infected while swimming, although the cutaneous route seems much more likely.

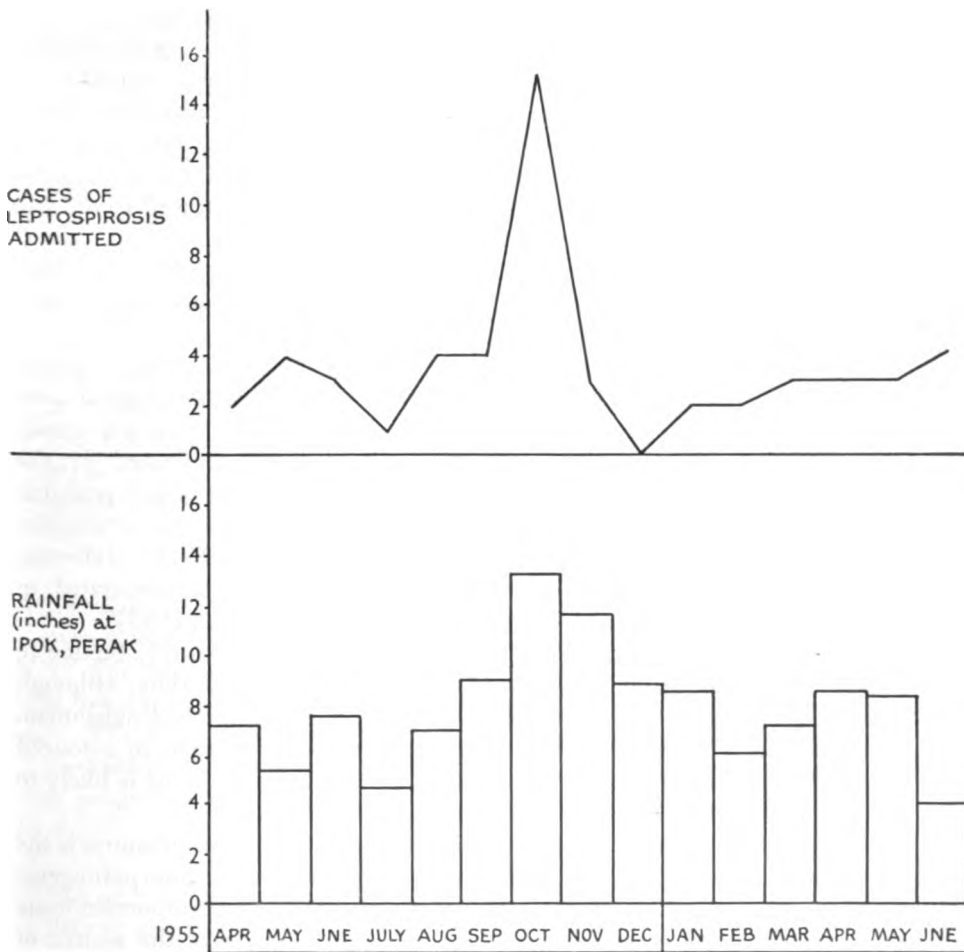


Fig. 1. The number of cases of leptospirosis admitted to Taiping Military Hospital over the period April, 1955, to June, 1956, compared with the rainfall in the same area.

DISCUSSION

Leptospirosis throughout the world is predominantly a disease of young adult males since they are the group most frequently exposed to pathogenic leptospiræ (Walch-Sorgdrager, 1939 ; Gsell, 1952).

Infection is believed to occur most commonly via the skin, especially if the surface is broken (van Thiel, 1948), but is also possible via the alimentary tract and conjunctivæ (Jorge, 1932 ; van Thiel, 1948). The finding of leg ulcers in 37.5 per cent of the present cases and the comparatively small number of men

who drank untreated water is presumptive evidence in favour of the cutaneous route.

The association of leptospirosis with water is well known and is reflected both in the occupational and seasonal variation. Occupations with a high incidence of the disease in the West are soldiers (Stokes & Ryle, 1916), port workers (Manson-Bahr, 1922), miners (Gulland & Buchanan, 1924), fish-cleaners (Davidson & Smith, 1936), abattoir workers (Johnson, 1950), and agricultural workers (Broom, 1951). In the East a similar increase has been found in sugar-cane workers (Doherty, 1955) and ricefield workers (Gsell, 1952). A seasonal variation occurs in Egypt (Vassapoulo, 1908), Europe (Schüffner, 1934) and Australia (Derrick *et al.*, 1954) at the times of maximum rainfall.

These correlations are emphasised in the present report both in the high percentage of cases in contact with water (91 per cent) and in association with heavy rainfall.

The racial factor is of particular interest in Malaya where men of widely separate origins are exposed to the disease under similar epidemiological conditions. The relative immunity of dark-skinned troops has been previously noted (Fairburn & Semple, 1956; Levis, 1957), and is confirmed by the present report. The reason for this may be that constant exposure to leptospiræ of low virulence produces a high incidence of sub-clinical infections. Immunity produced in this way has been shown to occur (van Thiel, 1948; Johnson, 1950) and serological evidence of past infection has been demonstrated in about a quarter of the Malayan civil population (Wisseman *et al.*, 1955).

Alternatively the immunity of the dark-skinned races may simply be due to the thickness of their skins. This would explain why the Gurkha, although equally a stranger to leptospirosis, is less frequently affected than the Englishman. The incidence of skin disease of all sorts is higher in white than in coloured troops and the presence of leg ulcers or macerated fungal infections is likely to decrease the effectiveness of the skin as a barrier to infection.

It is now agreed (Gsell, 1952) that the source of pathogenic leptospiræ is the urine recently voided by infected animals and that leptospiræ are non-pathogenic in the free-living state. The rats and other muridæ are the most important hosts of leptospiræ and have been firmly incriminated in Europe as the source of classical Weil's disease (Davidson *et al.*, 1934; Fairley, 1934). Other leptospiræ are pathogens in a variety of wild and domestic animals. Thus in Europe the principal host of *Leptospira canicola* is the dog, of *L. grippotyphosa* the field vole, of *L. pomona* the pig, of *L. sejro* the gleaner mouse and of *L. saxecoburg* the harvest mouse. In the rodents the infection is mild and hardly recognisable although the carrier state may be prolonged. The geographical distribution of the various types of leptospirosis is governed by that of the animal hosts since one animal species generally harbours predominantly one serotype or a few related serotypes.

It has been postulated (Gsell, 1952) that many of the specific antigens which characterise the various types of leptospiræ have been acquired during the existence of the organism in the body of the host. If this is correct the multiplicity

of leptospiral groups and types in Malaya (Trimble, 1957) would indicate a similarly large and varied number of animal hosts. These are probably various species of wild rodent, of which one-sixth has been found to have serological evidence of past infection (Wisseman *et al.*, 1955). It is perhaps surprising that rats were not noticed by more of the men in the present report, but the animals may be more timid than those in the towns. Jungle camps are used intermittently and in the unoccupied intervals are likely to become rat-infested. Stagnant water in the vicinity would then tend to become contaminated with leptospiræ.

The problem of preventing jungle leptospirosis is a formidable one since eradication of the carrier animals and drainage of stagnant water are practicable only in permanent jungle camps. Active immunisation is unlikely to be successful because of the large number of infecting strains and the absence of cross-immunity; second attacks of leptospirosis due to organisms of a different strain have been recorded on a number of occasions (Broom, 1958). Efforts must be concentrated on more efficient protection of the skin of jungle troops and development of footwear which will not produce softening and predispose to ulceration. Furthermore, men with leg ulcers should be withdrawn from jungle duty.

SUMMARY

The epidemiological features of 64 cases of leptospirosis in Service men in Malaya over a period of 15 months are presented.

The agency of water was evident in 58 out of 64 cases. Over one-third of patients had ulceration of the leg. Only 2 patients noticed the proximity of rats.

The various factors controlling infection with leptospiræ are reviewed and discussed. Suggestions are made for the more effective protection of the legs of jungle troops.

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A SURGICAL CAREER IN THE R.A.M.C.

Comments by a Recent Entrant from Civilian Life

AT this time it may be pertinent to consider the relative merits of an Army surgical career and a civilian one, and it will perhaps be of interest to learn something of the impressions gained by one who, prior to becoming a regular officer two years ago, was a senior registrar in general surgery. Possibly the words "general surgery" require some clarification. Nowadays civilian general surgeons seem to work largely on the abdomen and neck, excluding head, chest, and orthopædic conditions, though probably they will have some special interest either within the average field or, more rarely, outside it. My training as a senior registrar was average in this respect except that about one-third of my time was spent in working for a whole-time genito-urinary specialist.

Very shortly after joining the Service I was posted, as a surgical specialist, to a military hospital overseas and have remained there continuously since. The hospital is quite a busy one and I find that I have to work just as hard as, if not harder than, I did in civilian life. I do two or three "cold" operating-lists a week as compared with four or five as a civilian. The number of out-patients sessions is about the same. The amount of time spent on the initial management of emergencies has been, however, much greater since I was only rarely required to carry out this type of work in my civilian hospital.

It is in the quality, as opposed to quantity, that great differences from civilian surgery are seen, and at first sight it may seem that Army surgery comes off badly in comparison. Thus one did relatively far more major "cold" cases of a general nature prior to entering the Service. An average list, for example, would have at least one case such as a gastrectomy or thyroidectomy. Army "cold" lists are largely composed of so-called minor cases such as hernias, varicose veins and hæmorrhoids, with the addition of orthopædic cases of similar status such as menisectomy. Also there is a difference in the age of patients treated. In the average military hospital one rarely sees the elderly, and it is from this group that the civilian surgeon draws many of his major cases. However, if one examines the position more closely, I believe that the matter is shown in an entirely different light. The general surgeon's "bread and butter" major cases do come one's way in the Army with sufficient frequency to keep one in practice. I am not, of course,

referring to malignant cases, which are rightly evacuated to special centres. In addition, and this may not be obvious to an outsider, a large number of one's more serious and interesting cases in the Army are to be found amongst emergencies, and in this respect it is important to stress that an interesting or difficult case is not necessarily a serious one. A civilian general surgeon's emergencies tend to be rather specialised and it is often the practice to leave them to the care of the more junior staff. This is out of the question in military hospitals since the field which must be covered is so much greater. The following list will perhaps emphasise the extent of this field. It contains just some of the emergencies which have come my way during the past year and, from conversations with other surgical specialists, I am convinced that my experience has not been in any way exceptional.

A selection from the acute cases dealt with in one year.

1. *Many cases of extensive trauma, e.g.*
 - (a) a biliary peritonitis with multiple fractures ;
 - (b) a closed rupture of the duodenum with hæmothorax ;
 - (c) a fractured pelvis, femur and tibia with injury to the bladder and extensive skin loss on the buttocks ;
 - (d) a closed rupture of the small intestine and mesentery ;
 - (e) a closed rupture of the spleen and kidney requiring nephrectomy as well as splenectomy ;
 - (f) a closed rupture of the liver.
2. *Many major limb fractures*, several of them requiring open reduction and internal fixation.
3. *Many serious burns.*
4. *A fair number of serious hand lacerations.*
5. *Three craniotomies for intracranial hæmorrhage following injury.*
6. *Several serious non-traumatic abdominal emergencies, e.g.*
 - (a) a "spontaneous" intraperitoneal hæmorrhage ;
 - (b) a torsion of the gall-bladder ;
 - (c) an intraperitoneal hernia with gangrene of the small bowel ;
 - (d) a case of porphyria.
7. *Five cases of pyloric stenosis in babies.*

This list does not take into account what one might call the routine abdominal emergencies like appendicitis, of which there are a goodly number, and the very many minor fractures and dislocations which are the inevitable lot of any general hospital. It will be seen that the main emphasis here is on trauma, and for this reason, if one excludes the abdomen and perhaps the chest, it becomes clear that a large percentage of these cases would either never be seen at all by the average civilian general surgeon or, if initially admitted to his ward, would rapidly be handed over to the care of an appropriate specialist. In the same way out-patient

“cold” cases, if not coming within his particular field, would be similarly transferred without further ado. Such shelving of responsibility is not so possible in the Army.

With the above experience as background, I have attempted in the following section to analyse the differences in the quality and scope of surgery in Army and civilian life.

1. There is a loss in the Army of some major general surgery, especially in the late middle-age and elderly groups. On the other hand, one gets really splendid experience of trauma of all types, and there is scarcely any limit to the interests one may develop in this field.

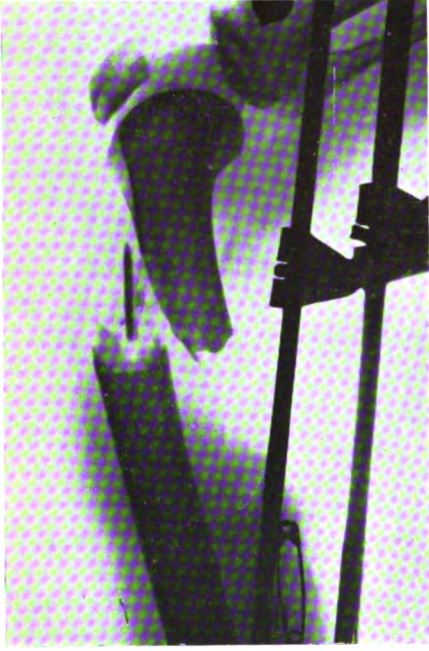
2. In the Army a much wider knowledge of diagnosis and management (and sometimes of definitive treatment too) is required. Here I should point out that I do not wish to give the impression that one is always acting on one's own. Every command has its consultant who is available to give advice and assistance at short notice and to give regular supervision. Also, through him, and in highly specialised problems, one has access to appropriate civilian authorities. Nevertheless if one is both to produce an economical service and to have a rewarding job, one cannot lean on these people too frequently. Moreover, in an emergency, there may not be the time. This, to my mind, is an extremely attractive aspect of Army surgery. One may well consider that the definitive treatment of a difficult case is outside one's proper scope, but it can be very satisfying to know that one at least has got the patient started on the right lines without, one hopes, too much delay. In short, a high standard in a sort of surgical general practice is needed and this, of course, is no easy matter to achieve, though the Army medical policy in respect of refresher courses is of great assistance here. Such study is essential if one is to apply the modern advances to military surgery.

3. There is a great opportunity in the Army to make a close study of many relatively minor conditions, especially those which are common in the serving soldier age group. The civilian surgeon may well be too preoccupied with serious cases for such investigations. Moreover, unlike his military counterpart, it is extremely unlikely that he will have many beds available for minor cases. This may seem a very trite comment to make and I must admit that I have often been guilty of groaning, at any rate inwardly, on being presented in the out-patient clinic with yet another case of backache or flat feet. However, as far as my own knowledge of many of these ailments goes, there is much which remains to be said about them, and though one may not make any epoch-making discovery one can at least learn to deal with them with more than average efficiency.

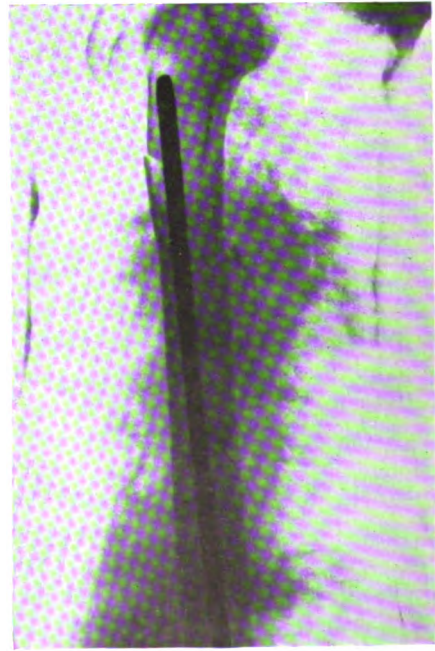
In conclusion, therefore, I would say that when one leaves civilian life to become a military surgeon, though one may lose a little in the way of major technical work, by way of exchange one is offered certain stimulating and challenging aspects of surgery which I believe are only rarely seen outside the Army. Whether one considers this to be an attractive prospect obviously depends entirely on the person concerned.



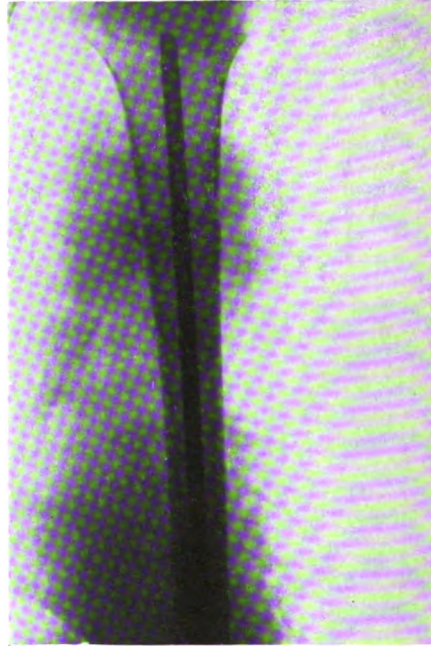
A. Lateral view of (right) supracondylar fracture before attempted reduction.



B. Lateral view of (right) supracondylar fracture after attempted closed reduction, showing best position of fragments obtained.



C. Lateral view of intra-medullary nailing of fragments of (right) supracondylar fracture.



D. P.A. view of intra-medullary nailing of fragments of (right) supracondylar fracture.

PLATE I

A CASE OF BILATERAL SUPRACONDYLAR FRACTURE OF THE FEMUR

BY

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SUPRACONDYLAR fracture of the femur is not an uncommon injury in Service personnel. This is due to the high incidence of road traffic accidents. The "Champ" is often the vehicle involved. The injury is caused by a direct blow on the flexed knee. This case of a double supracondylar fracture is, however, a rarity and is reported because it presents certain special problems in management and nursing.

A corporal of the Royal Military Police was admitted to the B.M.H., Hanover, on 15th March, 1958, following a road traffic accident in the Soltau district of North-West Germany. The accident occurred at 0230 hours and he was admitted to the German hospital, Soltau. He was transferred by ambulance to Hanover at 0700 hours the same day and arrived three hours later. An X-ray examination revealed a supracondylar fracture of each femur. The fracture on the left side was impacted and minimally displaced medially and posteriorly. The right side showed a supracondylar fracture which was grossly displaced (see Plate I, A). There was overlap and the distal fragment was flexed backwards on the proximal fragment, making an angle of 40 degrees, the gastrocnemius insertion flexing the lower fragment at the knee joint.

On admission, he was critically shocked, his blood pressure was 60/0 mm. of mercury and he could be roused only with difficulty. He was given an immediate transfusion of one pint of dextran followed by three pints of blood. The Martin transfusion pump was used. In an hour his condition had improved considerably and he had a blood pressure of 110/60 mm. of mercury. Arterial supply to both legs was normal and all pulses were palpable in the usual positions.

A Steinmann's pin was inserted through the right tibial tuberosity and skeletal traction maintained with the limb placed on a Braun's frame with the end of the bed raised 20 inches. This method of splintage was exchanged the following day for a bent-knee Thomas splint. At the same time a second Steinmann's pin was inserted through the left tibial tuberosity and similar traction was applied to this limb, using a second bent-knee Thomas splint. An X-ray examination of the right femur twenty-four hours after the application of traction showed the overlap to be partially overcome, but the displacement was still present (see Plate I, B).

Under anæsthetic three days after admission an attempt was made to reduce

the fracture on the right side by using slings and pads under the fracture site and exerting vertical traction. The attempt at reduction was a failure, which, at operation later, was shown to be due to interposition of soft parts, and the pressure exerted under the fracture site caused embarrassment to the circulation to the leg and foot. This method of reduction therefore had to be abandoned.

On 22nd March, 1958, seven days after admission, an open reduction of the fracture on the right side and insertion of a Kuntschner nail was carried out, an antero-lateral approach being used. The fracture was found to be comminuted with a free antero-medial fragment. There was interposition of muscle tissue between the fragments. A $16\frac{1}{2}$ in. by $\frac{5}{16}$ in. nail was used. There were $3\frac{1}{2}$ inches of bone in the lower fragment and an anatomical reduction was produced, using the loose fragment as a graft. Under X-ray control the lower end of the Kuntschner nail was brought to within three-quarters of an inch of the knee joint and became impacted in the anterior cortex of the femur, thus gaining a firm hold. A final X-ray showed complete anatomical reduction of the fracture (see Plate I, C and D).

It was not considered safe to leave the limb without external splintage because of the risk of external rotation of the leg at the fracture site. The fragments of the left fracture were manipulated into better position and then a double hip spica was applied.

The plaster was changed fourteen days later and after removal of the stitches a firm P.O.P. double spica was applied. At the time of writing, six weeks after operation, the satisfactory position of both fractures is maintained. The patient has been comfortable during this period and nursing has been no problem. Immobilisation of the limbs in a P.O.P. double spica will have to be continued, however, until union of the fractures is well advanced.

DISCUSSION

The control of the lower fragment in supracondylar fractures of the femur has, as Watson-Jones says, "exercised the ingenuity of generations of surgeons." In cases where there is a flexion deformity of the lower fragment, manipulation of the fragments without the aid of skeletal traction is invariably unsuccessful. Bohler recommends skeletal traction from a Steinmann's pin inserted through the tibial tuberosity with the limb placed on a Braun's frame with its angle behind the fracture site. A bent-knee Thomas splint may be used instead of the Braun's frame. Reduction is brought about using slings and pads applied under the fracture site. Successful results have been reported using a second Steinmann's pin inserted through the lower fragment of the femur and exerting vertical traction. This is, however, not without danger to the femoral artery as it emerges from the sub-sartorial canal. A Kirschner wire can also be used in the same way with less danger to vessels and nerves.

Closed reduction often fails, in which case open reduction must be used. Fixation with an intra-medullary nail can be used in some cases when the lower fragment is of sufficient length, but when this is too short a plate and screws

may have to be used. The use of plates and screws is, however, undesirable because of the proximity of the fracture to the knee joint.

All these methods are applicable in the single supracondylar fracture, but the nursing problems encountered with a double supracondylar fracture are considerable when both legs are on traction. For the patient to use the bed pan and urine bottle the legs must be widely abducted, which imposes an undesirable lateral pull at the fracture site. With both legs elevated on traction the entire weight of the body is taken on the sacral region. With the possibility of twelve weeks in this position the danger of skin sores is very great.

When two Thomas splints are applied to the same patient, the rings impinge on one another in the perineal region. Two pulley systems exerting longitudinal traction and two exerting upward traction require a complex system of weights, pulleys and strings. All weights must be free in their rise and fall, and two overhead beams are required with a scaffolding at the lower end of the bed. These pulley systems require constant adjustment and the patient suffers a considerable amount of discomfort. Our aim was to immobilise both fractures if possible so that the patient could be moved in bed, turned on his front, and make nursing as simple as possible.

The use of the Kuntschner nail for a supracondylar fracture has not been generally applied in the past because of the shortness of the lower fragment and the instability of the Kuntschner nail in this region. Our X-ray films show the lower end of the Kuntschner nail three-quarters of an inch from the knee joint and impacted against the anterior cortex of the femur, thus giving it a firmer hold in this part of the bone. The nail finds itself in this position because of the natural anterior bowing of the femur.

SUMMARY

A case of bilateral supracondylar fracture of the femur, the left side impacted and only slightly displaced, the right side grossly displaced, is described. Bilateral skeletal traction and the use of two Thomas splints led to considerable nursing problems and the right supracondylar fracture failed to reduce with slings exerting vertical traction under the fracture site. A Kuntschner nail driven to within three-quarters of an inch of the knee joint and impacted into the anterior cortex of the femur was used to reduce and hold the right femoral fracture. A bilateral hip spica was applied. Nursing was comparatively easy with this method and union proceeded with the fragments of both fractures in good position.

A PRELIMINARY REPORT ON ENCEPHALITIC TYPE OF ILLNESSES IN SINGAPORE

BY

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CASES of encephalitis and aseptic meningitis are very much more common in Singapore than in England. The term "aseptic meningitis" embraces a multitude of conditions in both countries, but in Singapore the prognosis of this syndrome, whatever its ætiology, is not as benign as in England. A significant number of cases in Singapore suffer from sequelæ in the form of emotional and neurological disturbances. This group of illnesses also carries a significant mortality and, in view of the number of cases occurring, an attempt has been made to study them from a clinical and epidemiological point of view.

The General Hospital, Singapore, very kindly gave us permission to see the notes of patients who had been admitted with encephalitis and aseptic meningitis, and these were studied in conjunction with the notes available from the British Military Hospital. Although the first patient to come under our personal care was in May, 1955, the study was taken back to the beginning of 1954. Any

Table 1. *Monthly incidence of encephalitis during the three-year period 1954-56*
(figures in parentheses indicate the number of deaths)

Status	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
Military ...	4	3	9	7	8	8	7	7	10	8	8	9	88 (15)
Civilian ...	21	16	22	24	19	17	18	21	26	19	21	21	245 (77)
Totals ...	25	19	31	31	27	25	25	28	36	27	29	30	333 (92)

It can be seen that there is no seasonal variation and the military and civilian population have a constant infectivity rate. The slightly higher death rate among civilians is possibly due to the relatively high incidence in children in this group.

Note.—In Tables 1, 2 and 4, "civilian" refers to local population (*i.e.* Malays, Chinese, Indians, Tamils). No Europeans are included amongst the civilian figures as they were private patients and no attempt was made to trace their old notes.

* At the time at which this survey was carried out, Major Dowling was D.A.D.A.H., Singapore Base District, and Captain Webb was Junior Medical Specialist at B.M.H., Singapore.

Table 2. Distribution of military and civilian cases according to age group
(figures in parentheses indicate the number of deaths in each group)

Age Group	1954-56		
	Military	Civilian	Total
Birth ...	4 (3)	38 (6)	42 (9)
6 months ...	5 (3)	22 (4)	27 (7)
1 year ...	2	26 (9)	28 (9)
2 years ...	2 (1)	20 (9)	22 (10)
3 years ...	1	23 (10)	24 (10)
4 years ...	4	14 (5)	18 (5)
5 years ...	8 (2)	53 (23)	61 (25)
10 years ...	11 (2)	18 (3)	29 (5)
20 years ...	33 (2)	14 (3)	47 (5)
30 years ...	12 (1)	8 (2)	20 (3)
40 years or over	6 (1)	9 (3)	15 (4)
Totals (all ages)	88 (15)	245 (77)	333 (92)

Table 3. Analysis of all cases 1954-56 according to race and age group
("European" represents the expatriate military population, except for the Gurkhas, who are included amongst the Indians)

Age Group	Totals						Total (all races)
	Race						
	Chinese	Malay	Indian	European	Others	No record	
Birth	33	2	2	1	3	1	42
6 months	19	1	4	2	1	—	27
1 year	24	1	2	1	—	—	28
2 years	19	2	—	1	—	—	22
3 years	19	2	3	—	—	—	24
4 years	10	1	3	2	1	1	18
5 years	46	2	3	8	—	2	61
10 years	16	3	—	9	1	—	29
20 years	9	9	2	26	1	—	47
30 years	4	1	3	12	—	—	20
40 years or over ...	6	—	2	6	1	—	15
Totals (all ages) ...	205	24	24	68	8	4	333

case notes which suggested a lower motor neurone lesion of the trunk or limbs were provisionally labelled as polio-myelitis and have not been included in the study. The same has also applied to those which showed a persistently low cerebro-spinal fluid sugar, suggesting a septic process. Including those cases personally seen, 333 case histories were available for study by the end of 1956. Tables 2 to 4 show the distribution of these cases according to age, race, civil or military status and length of stay in the island before the onset of the disease. The monthly incidence during the three year period 1954 to 1956 is shown in Table 1 and the case fatality rate according to age group in Table 5.

Table 4. *Further analysis of military cases and length of stay in Singapore before the onset of the disease*

(figures in parentheses represent the numbers of deaths in each group)

Length of stay in Singapore before onset of disease (in years)					Local inhabitants	No record	Total
Less than 1	1 +	2 +	3 +	4 or over			
40 (8)	20 (1)	4 (2)	1 (0)	—	16 (4)	7 (0)	88 (15)

Note.—The 16 local inhabitants quoted are either Malay troops or their dependants serving with the British forces in Singapore.

Table 5. *Case fatality according to age group in the whole series*

Age Group (years)	Cases	Deaths	Case Fatality %
Birth ...	69	16	23.2
1 year ...	92	34	37.0
5 years ...	61	25	41.0
10 years ...	29	5	17.3
20 years or over	82	12	14.6
Totals (all ages)	333	92	27.6

No attempt has been made to draw definite conclusions from these figures because of several factors. These include the difficulty in tracing and interpreting old records, and also the racial differences reflected in hospital statistics for the civilian population. The Malay, who is of the Muslim religion, is much less inclined than the Chinese to bring his relatives to hospital, which may account for the relatively small proportion of Malays in Table 3. However, the comparison of age distribution of cases in the local and the European population (Table 2) is of interest. Among the local population, encephalitis appears to occur chiefly in young children (see also Fig. 1). Amongst Europeans, however, who represent a recently arrived community, the disease is distributed evenly through all age groups. This suggests that it is endemic in Singapore, and that some form of immunity is built up at an early age among the local population. Reports from

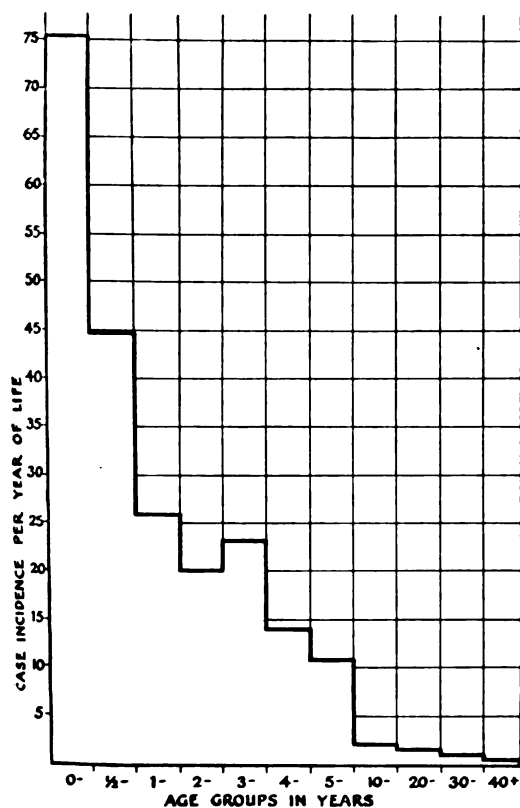


Fig. 1. Case incidence per year of life in each age group—civil cases only

Bangkok, Jakarta and Hong Kong indicate that they have a similarly high incidence of this type of illness. Whether the case distribution and ætiology is the same is not known at the present time.

CLINICAL PICTURE

This is characterised by severe headache, vomiting and fever for 24 to 48 hours before admission. The emphasis is on the headache which is described in phrases such as "It feels as if my head is going to burst." There is no relevant past history, but in a few cases other members of the family have had a severe headache and fever which have passed off without further incident. More careful questioning of the patient elicits in some cases that, although they have been at work until 24 hours before admission, they have not been completely fit because of a cough and generalised aches and pains.

Physical examination

The patients are generally febrile, but not necessarily so, with temperatures ranging up to 107° F. The impression gained is that the higher the temperature, the worse is the prognosis. The higher temperatures occur mostly in children.

Suffusion of the upper trunk and face is a fairly common feature, associated with conjunctival injection. They are mentally disturbed, the disturbances varying from gross hallucination to a mild but definite exaggeration of their own psychiatric type. In a few cases the original admission was to a psychiatric ward. Many are slow and unresponsive with a tendency to the Parkinsonian type of features. The latter may be due to the severe headache which is undoubtedly made worse by facial movements. There is usually discomfort on movement of the eyes, and in the severe cases conjugate movement of the eyes is lost.

Further examination at this stage commonly elicits no further abnormality. Important negative points are absence of lymphadenopathy, palpable spleen, rash and eschar. No abnormality is noted in the central nervous system apart from the mental change. Sometimes a stiff neck is present, but this is not an essential feature in the early stages of the disease.

Many cases never develop further than this stage. If, however, neurological complications do ensue they are frequently heralded by a convulsion. In such cases it is interesting to note that the fit is usually a focal one. Two patients are called to mind particularly, in whom myoclonic twitching commenced in the right hand, spread to the right side of the face, down the right arm and eventually down the right side of the body. From this preliminary stage of focal fits the disease often progresses to deepening coma and death. A few recover after a variable length of time, but the prospects of a full mental and physical recovery are poor after an illness as severe as this. The onset of coma is a bad prognostic sign in adults but not necessarily in children.

The neurological signs are pleomorphic. In the cranial nerves, abnormalities of the pupils and loss of conjugate movement of the eyes are those most frequently seen. Athetoid movements of the limbs occur and also many Parkinsonian features, such as cog-wheel rigidity and tremors. The tremors appear coarser than those usually seen in Parkinson's disease. Hemiplegias are common in the severer types of illness. The commonest lesion appears to be supra-nuclear and often associated with a hemiplegia and abnormal movements of the limbs. Other signs noted in some patients were a fall in the blood pressure, probably due to a central lesion causing peripheral circulatory collapse, and also minimal chest signs which were bronchitic rather than pneumonic. On no occasion have hæmorrhagic manifestations been noted in the skin or fundi. In children the history and findings on examination are similar, but fits are generalised rather than focal.

Disease of Gurkha infants

There is a syndrome which seems to fall into a category of its own, affecting particularly Gurkha infants. These infants are usually under 6 months of age and seldom over 18 months. Certain points in the history of their illness are very striking and show great similarity.

The child is usually well until a few hours before admission and, in many cases, a few hours before death. There is often the story of a mild respiratory tract infection during the previous week, but this has not been sufficient to

distress the child. On examination the child has a raised temperature, but its peripheries are cold, and there is a bluish tinge about the nails and lips. There is, in fact, a severe peripheral vaso-motor collapse. The respiratory rate may be slightly increased, but not usually to more than 40 per minute, and it is often irregular in type sometimes resembling Cheyne-Stokes respiration. The air entry over the lungs is good, and in many cases no adventitious sounds are heard on auscultation, but occasionally there are rhonchi and crepitations, particularly if the child has been in coma for some time. There are insufficient physical signs in the lungs to account for the cyanosed state, and the administration of oxygen does not materially help. If present, signs in the central nervous system appear to be confined to abnormalities of the pupils. Very soon after admission coma ensues, quickly followed by death. The whole course of the disease may last only twelve hours or less.

Because of the blueness, the slightly increased respiratory rate and the occasional signs in the chest, this syndrome has been attributed to an acute respiratory disease. However, the irregularity of respiration, the abnormality of the pupils and the profound peripheral vaso-motor collapse suggest a central origin for the condition.

These infants undoubtedly have a viral pneumonia as shown at post mortem, but in view of the cerebro-spinal fluid findings we feel that the principal cause of death may be a primary central nervous system lesion rather than a pneumonia.

Laboratory investigations

White blood count: This is commonly on the high side of normal, with a polymorphonuclear leucocytosis. Counts ranging from 7,000 to 24,000 cells per cubic millimetre have been observed.

Cerebro-spinal fluid: In several cases this has been normal on first tap in spite of well-established neurological signs. Within two to three days a pleocytosis has developed, usually lymphocytic, although in a few cases the initial count has been entirely polymorphonuclear. In the Gurkha infants, the chief abnormality appears to be in the protein, which is invariably raised but to a varied extent. Usually it is over 100 mg. per cent at the first tap with very few cells present (5 to 20), but high figures for protein (320, 420 and 615 mg. per cent) have been recorded. This tendency towards a high cerebro-spinal fluid protein is also occasionally seen in the adult, although sugar and chlorides are invariably normal.

Early tests suggesting a raised titre to the OXK antigen were not confirmed when using antigens from another source and results were ascribed to non-specific reactions with the hypersensitive antigen first used.

Post-mortem findings

Complete histological reports have not yet been obtained as the study of neuro-pathology is a very specialised one. However, in the fatal cases the histological reports available show that there was a definite encephalitic process taking place in the brain substance. Changes in the lungs have been variable and it is possible that there are at least two different types of central nervous system

disease, one without associated lung involvement and the other, chiefly in Gurkha infants, where the lung shows a pneumonic process in which the infiltrating cell is mononuclear and not polymorphonuclear. A point of importance arises here from the study of case documents of these children in the past. In many fatal cases the skull has not been opened because the cause of death has been assumed to be pneumonia. Also, for the same reason, many infants did not have a lumbar puncture, and it is suggested that all cases admitted to hospitals in FARELF with a history and findings as described above should have this investigation as a routine.

Sequelæ

Change in personality has been a common feature. Inability to concentrate, lack of confidence in doing things which are normally enjoyed and skilfully done, poor temper control and the inability to accept responsibility are the most frequent disturbances encountered. Reversal of sleep rhythm has been seen on several occasions. In one case the patient was admitted to the psychiatric ward with a provisional diagnosis of acute schizophrenia.

Organic neurological complications also occur in the form of Parkinsonism and hemiplegia. The latter is seen particularly in children who also tend to develop mental deficiency with a continued liability to fits.

TREATMENT

In the early stages of the investigation, circumstantial evidence indicated the possibility that the causative organism was of rickettsial type. For this reason, and in the absence of any known specific treatment for the disease, a trial was made of chloromycetin in the same dosage as for scrub typhus. Owing to the small number of cases treated, no significant assessment could be made of the effect of treatment. However, although it now seems unlikely that a rickettsial organism is involved, the impression was that chloromycetin was of benefit in some of the severe cases. Before any more definite statement can be given, a planned trial of treatment should be carried out.

In the management of the disease in Gurkha infants every effort should be made to treat the peripheral circulatory collapse. It is suggested that intravenous transfusion with plasma, noradrenaline and cortisone would be a logical course together with the other usual supporting measures. In all cases, unconscious patients should be nursed in a position to prevent inhalation of vomit, which was a frequent terminal cause of death.

EPIDEMIOLOGY

The epidemiological study began in late February, 1956. A preliminary plotting out of the addresses of the series revealed that the distribution of cases, contrary to expectation, did not correspond to population concentration. The incidence over the years appeared to be confined to small, localised foci similar to the "islands" of transmission so characteristic of scrub typhus. This finding,

together with the rises in titre obtained in some of the cases with the OXK suspension used in earlier tests, led to the suspicion that the disease was a variant of infection with *Rickettsia orientalis*. As Lieut.-Colonel R. Traub, the officer in charge of the United States Army Medical Research Unit at Kuala Lumpur, was experienced in the epidemiology and control of scrub typhus, his aid was enlisted in carrying out rat-trapping and ectoparasite counts in the military foci of the disease.

In all cases a heavy rat infestation, with a relatively high trombiculid mite (*Trombicula deliensis* and *Euschöngastia indica*) index, was recorded. Blood-sucking mites, fleas and ticks were also found but not in such abundance. This apparent support of a scrub typhus hypothesis led to intensified mite control in military areas, the routine use of the Weil-Felix OXK agglutination test in all suspected cases and the trial of chloromycetin, especially in the more seriously ill.

Plotting of the addresses of civilian cases revealed the presence of many small foci in the city as well as in the rural areas. This occurrence of the disease in the centre of the city appeared to discredit the possibility of transmission by mites. However, a programme of intensive rat-trapping showed that the trombiculid mite, *E. indica*, could be found in large numbers even in the middle of built-up areas. The rat host in country districts was chiefly *Rattus diardi*, whereas in the town the latter was displaced at least in part by the brown rat *R. norvegicus*. The life cycle of *E. indica*, which is being carefully studied, allows for development either in scrub or in rat nests and burrows. Blood-sucking mites and fleas were more commonly found on the town rats.

Further information was obtained from a study of the year 1954, which was a serious year for both encephalitis and poliomyelitis. A comparison of the monthly incidence of the two diseases, which had previously been confused, shows that there is no apparent relationship between them (see Fig. 2). An interesting piece of circumstantial evidence to support the theory of mite transmission was given by the accidental infection of a soldier who slept in the room adjoining the laboratory in which rats were killed and the mites collected. He made a complete and rapid recovery.

In an attempt to control further incidence of the disease, all known foci within military areas were treated with insecticide. Dieldrin, because of its known efficacy against mites, fleas and mosquitoes, was used and all areas of scrub and grass were fogged with swing fog machines at a dosage of about 4 oz. dieldrin per acre. The control, as evidenced by the trombiculid mite index, appeared to last rather less than a month, so the process was repeated using the aerosol attachment of the machine, and applying the insecticide at an estimated dose of 10 oz. dieldrin per acre. This was repeated two months later when the mite index began to rise slowly, and the index fell and remained at almost zero for at least five to six months. Since the initial spraying, no cases have occurred within the military areas. However, Service cases continue to occur among families living outside garrison areas in civilian accommodation which invariably has been within known civilian foci. Cases continue to occur as before among the civilian population.

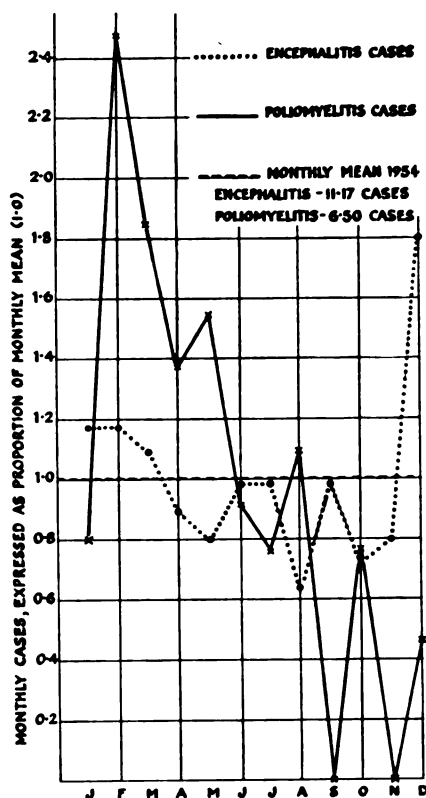


Fig. 2. Comparison of the monthly incidence during 1954 of poliomyelitis and encephalitis cases in Singapore

DISCUSSION

No attempt has been made in this preliminary report to discuss definitive diagnosis. In Singapore are found all the usual agents which can cause encephalitis (*e.g.* the viruses of mumps, measles, herpes, lymphocytic chorio-meningitis, the coxsackie virus and many others). Japanese B encephalitis is more specific to the Far East and was undoubtedly the cause of illness in some of the patients seen. However, the majority did not appear to fit into this virus group. If the disease described was due to any of the viruses of world-wide distribution already known to cause encephalitis, then it would be of considerable interest because of the frequency of clinical cases. From an epidemiological point of view and the types of illness encountered it seemed likely that the causal agent or agents would be found in the group of arthropod-borne viruses.

In view of this, the assistance of the U.S. Army Medical Research Unit in Kuala Lumpur was requested and was generously given. Through its Commanding Officer, Lieut.-Colonel Traub, M.S.C., a grant was obtained from the National Research Council for one of us (H. E. W.) to remain in Singapore for one year to work jointly with the U.S.A.M.R.U. collecting clinical material and suitable specimens for virus isolation and serological testing.

At present, with the complete co-operation of the General Hospital, Singapore, and the Service hospitals, the material from well over 100 patients is being studied by the U.S.A.M.R.U. They are attempting to isolate viruses from the post-mortem material collected, to test serologically for herpes, mumps, lymphocytic chorio-meningitis, glandular fever, leptospirosis, encephalo-myocarditic virus and Japanese B encephalitis. They are also testing the sera against any other agent or agents isolated by them from patients or possible vectors. Many of these results will shortly be made available.

At the time of writing, one of us (M. A. C. D.), who was in charge of the epidemiological study of the series, has been seconded to the World Health Organisation in Africa. However, routine collection of mosquitoes and mites and recording of other epidemiological data continue. Thus, if any new viral agent should be isolated or some more definite information be found regarding the vector, the data gathered will be invaluable in the further study of the disease.

It is hoped that this preliminary report will be of use to members of the Royal Army Medical Corps who come to Singapore and Malaya in the future, and that the investigation will continue until the aspects of this problem which remain obscure can be finally resolved.

SUMMARY

A brief description is given of the clinical and epidemiological aspects of a series of cases of encephalitis in Singapore. Virological and pathological study of material continues and a more detailed report will be issued at a later date.

Our thanks are due to many people whose co-operation made this investigation possible: these include the Director of Medical Services, FARELF, Brigadier Hennessey; Colonel Morrison, the Consulting Physician; Colonel Robinson, D.D.A.H.; Colonel Ross, A.D.M.S., Singapore Base District; Lieut.-Colonel Field, Assistant Director of Pathology, FARELF; Captain Brain, R.A.M.C.; Lieut. Hughes, R.A.M.C.; and the Statistical Department, G.H.Q. Singapore. Also we would like to express our appreciation of the valuable help given by Lieut.-Colonel Traub of the United States Army Medical Research Unit at Kuala Lumpur and his staff; the Government Health Department, the City of Singapore Health Department, and the staff of the Singapore General Hospital.

THE USE OF SELECTIVE MEDIA FOR THE DETECTION OF BETA-HÆMOLYTIC STREPTOCOCCI

BY

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THE isolation of beta-hæmolytic streptococci from the throats of healthy carriers and convalescent patients is known to present difficulties owing to the relatively small number of streptococci present (Pike, 1945). The inefficiency of standard techniques is illustrated by the fewer isolations of beta-hæmolytic streptococci obtained from pre-tonsillectomy throat swabs than from tonsils excised from the same patients (MacDonald, Simmons & Keogh, 1940; Rantz, 1941; Keith & Carpenter, 1946).

To improve the yield of streptococci several techniques have been devised. Garrod (1942) incorporated gentian violet in blood agar, taking advantage of the relative resistance of streptococci compared with other Gram-positive bacteria to the aniline dyes. Pike & Fashena (1946) found that they could increase the yield of streptococci in carriers from 14 per cent to 42 per cent by using enrichment with blood broth containing sodium azide and crystal violet. Anaerobic culture has been used to increase the yield of beta-hæmolytic streptococci (Coffey, 1941; Jones, Holmes & Hale, 1941; Cook & Jebb, 1952).

Because we were examining large numbers of throat swabs we felt that it would be of value to compare some of these methods and, in addition, to compare them with a method of enrichment suitable for most respiratory pathogens.

METHODS AND MATERIAL

Methods

The swabs were of cotton-wool on wooden applicators. Plating was carried out within two hours of taking the swabs and the growth was examined after eighteen hours' incubation at 37° C.

The following methods of culture were used :

- (1) 5 per cent horse blood agar incubated aerobically.
- (2) 5 per cent horse blood agar incubated anaerobically.
- (3) 5 per cent horse blood agar containing crystal violet to a final concentration of 1 : 500,000 incubated aerobically.

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- (4) Preliminary incubation in an enrichment medium based on that of Pike (1945) and modified by Holmes & Lermitt (1955). This consisted of 5 ml. nutrient agar containing 5 per cent horse blood, 1 : 500,000 crystal violet and 1 : 16,000 sodium azide, in a test-tube. The swab was plunged into the agar and incubated overnight. Next day the swab was plated on to blood agar containing 2 μ g./ml. streptomycin and 1 : 500,000 crystal violet, which is a selective medium for streptococci.

Hæmolytic streptococci were sub-cultured to obtain the organism in pure culture, a Gram stain was done to confirm the morphology and the organism was grouped first by Maxted's (1953) method using bacitracin-impregnated discs and then by Maxted's (1948) enzyme modification of Lancefield grouping. Isolation of streptococci was regarded as a failure unless the colony could be picked off the primary plate and a pure culture obtained.

Material

- (1) Swabs from 2,000 soldiers *not* suffering from sore throat were cultured on blood agar, aerobically (Method 1), anaerobically (Method 2) and aerobically with the addition of crystal violet to the medium (Method 3).
- (2) Swabs from 520 healthy children and adults living in the Paddington area were plated on blood agar aerobically (Method 1), crystal violet blood agar aerobically (Method 3) and preliminary enrichment followed by plating on a selective medium (Method 4).

RESULTS AND DISCUSSION

The results are shown in Tables 1 and 2.

Examination of Tables 1 and 2 reveals that blood agar plates incubated aerobically and the use of crystal violet blood agar plates are less efficient methods for isolation of scanty hæmolytic streptococci from throat swabs than incubation of blood agar plates anaerobically ($P < 0.01$) (Table 1). Better yields can also be obtained by the use of a modification of the Pike enrichment method followed by plating onto a selective medium containing streptomycin and crystal violet (Table 2, (b)).

The use of crystal violet, sodium azide and streptomycin is to reduce the growth of throat commensals such as *Neisseria catarrhalis*, diphtheroids and staphylococci which tend to overgrow hæmolytic streptococci and to obscure their hæmolytic zones when the streptococci are present in small numbers. Anaerobic culture probably increases the yield by a similar mechanism since many of the common throat organisms grow poorly under anaerobic conditions whilst streptococci grow well. The alternative possibility that there is a significant number of hæmolytic streptococci in the throat requiring anaerobic conditions for growth or the development of hæmolytic zones was excluded by the successful aerobic subculture of all the hæmolytic streptococci isolated only by anaerobic culture. Anaerobic culture also interferes with the production of hæmolytic

zones by the hæmolytic hæmophilus whose presence on the blood agar plate may cause confusion with the hæmolytic streptococcus.

Our findings agree with those of Jones *et al.* (1941) and Cook & Jebb (1952), who found aerobic culture to be less efficient than anaerobic culture but that the two methods in combination give a higher yield of streptococci than either one used alone (Table 1).

The use of primary enrichment as described in Method 4 is especially of value when it is necessary to send swabs through the post or when there will be considerable delay before plating can be carried out (Holmes & Lermitt, 1955).

In our experience ordinary blood agar plates incubated aerobically are adequate for diagnosis of streptococcal sore throats where streptococci are present in large numbers. However, in the identification of streptococcal carriers anaerobic culture or a combination of enrichment and selective media should be used in addition.

SUMMARY

Methods of isolation of beta-hæmolytic streptococci from healthy carriers have been investigated. Culture on blood agar incubated anaerobically is efficient and gives better results than aerobic incubation. The use of crystal violet blood agar did not significantly increase the yield of streptococci from carriers.

Primary culture in sodium azide, crystal violet, blood agar enrichment medium, followed by subculture on to streptomycin and crystal violet blood agar, gives excellent results but is rather cumbersome for routine use.

Table 1. *Isolation of hæmolytic streptococci from 2,000 throat swabs from soldiers not suffering from sore throat*

Method of culture	Number of isolations of streptococci Group A	Total isolations of beta-hæmolytic streptococci
Aerobic blood agar. (Method 1) ...	202 (10%)	441 (22%)
Anaerobic blood agar. (Method 2) ...	280 (14%)	519 (26%)
Aerobic blood agar with crystal violet. (Method 3)	224 (11%)	444 (22%)
Combination of aerobic and anaerobic blood agar. (Methods 1 and 2) ...	310 (15.5%)	584 (29%)

Table 2. *Isolation of hæmolytic streptococci from 520 throat swabs taken from well children and adults: a comparison of (a) direct plating, (b) enrichment and (c) the two methods in combination*

Method of culture	No. of isolations of streptococci Group A	No. of isolations of beta-hæmolytic streptococci
(a) Aerobic blood agar and aerobic blood agar crystal violet. (Methods 1 and 3)	69 (13%)	118 (23%)
(b) Enrichment medium plus streptomycin crystal violet blood agar. (Method 4)	99 (19%)	121 (23%)
(c) Yield of streptococci using a combination of direct plating and enrichment. (Methods 1, 3 and 4) ...	113 (22%)	162 (31%)

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Obituary

COLONEL RONALD NORMAN PHEASE, M.B.

Late Royal Army Medical Corps

COLONEL RONALD NORMAN PHEASE, M.B., died at Bath on 22nd August, 1958, at the age of 67. He graduated in 1915 at Edinburgh, where he was a member of the O.T.C. Shortly after, he was commissioned in the Royal Army Medical Corps and was posted to Mesopotamia where he served until 1919, later proceeding to Egypt, where he remained until 1924. It was during his service in Egypt that he first became seriously interested in pathology and bacteriology.

During his career in the Army he held appointments as demonstrator in pathology at the Royal Army Medical College and was Deputy Assistant Director of Pathology, Lahore District, on his first tour in India and at Peshawar and Rawalpindi Districts on his second tour. He later commanded the Enteric Reference Laboratory, Kasauli, and his last appointment in India was Officer Commanding the Central Medical Pathology Laboratory, Poona. On his return to the United Kingdom in 1946 he commanded the Emergency Vaccine Laboratory, Everleigh (now The David Bruce Laboratories). On retiring from the Army, he joined the Public Health Laboratory Service as Director in Stafford, where he worked until his final retirement in 1956.

As Officer Commanding the Emergency Vaccine Laboratory from 1946-48 he carried out much useful experimental work on behalf of the Army Pathology Advisory

Committee. In the Public Health Laboratory Service he was a valued member of various working parties, particularly one conducting a practical study of the laboratory diagnosis of tuberculosis, of which he was the convener and in which he took a very active part.

Ronald Phease was not inclined to voice his opinions unasked, but these were sought and appreciated more often than is generally known, as they were invariably based on careful judgment and shrewd common sense. Though often expressed with an air of diffidence, this did not mislead his friends as to their true worth. H. T. F.

BRIGADIER D. B. McGRIGOR, O.B.E., M.B., D.M.R.E.

BRIGADIER D. B. McGRIGOR, formerly consultant radiologist to the Army, died in Colchester after a short illness on 22nd October, aged 73.

Dalzeil Buchanan McGrigor joined the Royal Army Medical Corps in 1907 after graduating at Aberdeen. From 1909 to 1914 he saw service in India, where he qualified with distinction at the Indian X-ray Institute. In the early part of the first world war he saw active service in France with the Indian Expeditionary Force in charge of No. 1 Field X-ray Section and returned to India in 1917. He was awarded the O.B.E. in 1919 for his services.

After taking the D.M.R.E. of Cambridge in 1920, he was appointed specialist in radiology at The Queen Alexandra Military Hospital, Millbank and lecturer in radiology at the Royal Army Medical College. He retired from the active list in 1927 and was appointed adviser in radiology to the Army Medical Services.

On the outbreak of the second world war he was recalled from the reserve and organised the Army School of Radiology, being appointed consultant and promoted brigadier in 1941. After the war he continued to serve as honorary consultant to the Army until his retirement in 1952 at the age of 67.

J. M. W. writes: I first met Mac in the summer of 1914. We did not meet again until 1921 at The Queen Alexandra Military Hospital, Millbank, where he was the radiological specialist, and a lasting friendship started. On my return to Millbank in 1928, he was the greatest help to me on the Advisory Radiological Committee. He knew what the Army Medical Service would need in the way of radiological equipment and he did an immense amount of work in getting the X-ray sets ready for active service. In 1940 and 1941 we worked together at the War Office and he was a tower of strength. His records were meticulous and he saw everything himself in the way of equipment and radiological personnel. To all ranks he was kindness itself.

He was a man of many interests: for several years he was a most able secretary to the R.A.M.C. Officers Widows and Orphans Friendly Society. He was a first-class mechanic, and possessed many clocks and expert knowledge in looking after them. Perhaps his greatest feature was his capacity for making friends. He had travelled widely and was always asked to return. He leaves a wife, who most ably assisted him at all times, a daughter and two sons, both medical men. Our deepest sympathy goes out to them.

A great and lovable character has left us, and one feels all the better for having known him.

Correspondence

From Major-General R. E. Barnsley, C.B., M.C., M.B.

DEAR SIR,

In your issue of July, 1957, you published a list of medical personnel who participated in the battle of Waterloo. In a covering letter I told how this came into my possession as a result of the publication of the picture of an unknown young purveyor for identification in *Country Life*, and expressed a hope that

his medal and his pocket book which contained it might come into the possession of our Corps museum.

I am glad to say that our hopes have now been realised, thanks to the good offices of Mr. Eland of Dunmow and to the generosity of Mrs. Chesterton and her relatives in New Zealand and the United States, who have all been consulted and have agreed to the transfer.

Deputy Purveyor Robinson's pocket book now forms one of the most interesting items in our collection. The Waterloo medal itself is contained in its original wash-leather case and, oddly enough, a buttonhole has been sewn into the ribbon which would seem to indicate that Robinson was in the habit of wearing his medal attached to his waistcoat button !

There is also a circular rosette in red, blue and silver which might have decorated his headgear. Stuffed into a pocket in the cover of the book are many old letters and documents. Among these are several letters from his friend and fellow purveyor Jonathan Croft.

Perhaps the official documents have the greatest interest for us today. There is his billeting notice dated 7th July, 1815, instructing the Mairie du Deuxième Arrondissement to furnish "logement à un Capitaine Anglais et son suite," and a location list of troops under command of Sir Thomas Graham dated 17th April, 1814. The list of medical personnel at Waterloo, in Sir James R. Grant's own handwriting, is proudly endorsed "Certificate of my being present at the Battle of Waterloo. George Robinson."

The typewriter must surely be held responsible for the masses of paper which come so near to clogging the whole administrative machine nowadays. Today if the D.M.S. of an army sets forth he is preceded by a cloud of paper with "distribution" to five or six people concerned and "Copies to" a dozen or so more (who could not care less) all giving the "E.T.A.," etc. etc.

Things were very much simpler in 1816 when, on 19th August, Sir J. R. Grant, the Duke's P.M.O., sat down, took out a piece of notepaper and wrote and addressed a note in his own hand as follows : "My dear Sir, As my progress has been less rapid than I calculated owing to the many hospitals I have had to inspect, I expect to be in Cambrai on Sunday. You will therefore act accordingly and inform any who may be interested, officially or otherwise."

The pocket book itself is in red morocco and bears the name "George Robinson" in gold letters. The first page reads "George Robinson, Dy. Purveyor to the forces. Duke of Wellington's Headquarters, Paris, January, 1816. Entered this town 7th July, 1815." Then follow a number of pages containing skilful drawings in pencil, pen and water-colour of landscapes and local types. The rest of the book is blank except for the last few pages, which show Robinson in sentimental mood. Some of the verses are recognisable, but surely the "Ode to the Forget-me-not which blooms on the Field of Waterloo" must be original. It begins :

"Where sleep the brave on honour's sainted bed
Thou, lovely flower, art wildly seen to wave
Thy fragrant incense o'er the valiant dead
A blooming tribute to the soldier's grave."

and so on through five verses. This is followed by :

“Oh! say not woman’s heart is bought by vain and empty treasure,
Oh! say not woman’s heart is sought by every idle pleasure,”

which seems to have a familiar ring, though I have not been able to identify the author. Next come Thomas Moore’s “Believe me if all those endearing young charms” and “The last rose of summer.” The poetry ends on a gloomy note with another unidentified poem. Then, as something of an anticlimax, we are given a recipe for making ginger wine !

The question as to whether the dashing young purveyor of the picture was indeed the romantic George Robinson of the pocket book is still undecided and is likely to remain so. There is only one very meagre clue : the man in the picture is strikingly handsome and, in one of his letters, Croft expresses a hope that “a good looking happy fellow like you is flourishing.”

I am, etc.

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Hants.

R. E. BARNSELY.

Enclosed with General Barnsley’s letter was a photostat copy of the list of Medical Staff officers employed in the field at the battles of Quatre Bras and Waterloo, which was published in this JOURNAL last July (page 158).

It is interesting to note that although only a duplicate, the whole page of foolscap is written in Sir J. R. Grant’s own hand.

“How many Ds.M.S.,” asks General Barnsley “would bother to do this for an obscure captain today?”—ED.

Book Reviews

SIR CHARLES BELL—HIS LIFE AND TIMES. Sir Gordon Gordon-Taylor, K.B.E., C.B., F.R.C.S., and E. W. Walls, M.D., Ch.B., B.Sc., F.R.S. (Ed.). Edinburgh and London : E. & S. Livingstone Ltd. 1958. Pp. 288+xii. Illustrated. 42s.

Eponymous terms are less fashionable than they used to be, but who in the medical profession has not heard of the external respiratory nerve of Bell or of Bell’s palsy ? It is over 150 years since Charles Bell, the son of a Scottish minister, left Edinburgh to win fame in London. This book gives an account of his early life and the Edinburgh background of the late eighteenth century. Bell had instruction in anatomy there from the second Monro, and in its application to surgery from his elder brother John, an established Edinburgh surgeon, to whom he was apprenticed. We are shown something of the early days of the *Edinburgh Review* and of his youthful friends, the young Whig lawyers and politicians, Broughton, Sidney Smith and Horner, who all attained eminence later.

He remained in London for thirty-two years, and despite struggles and difficulties achieved an assured place in history as an anatomist, physiologist, surgeon and artist. His interests were wide—perhaps too wide. As a clinical observer, collector of museum specimens and prolific recorder and medical

artist he was outstanding. His contemporaries included great names in surgery—Astley Cooper, John Abernethy, Brodie, Cline and Guthrie. We are given an account of the Great Windmill Street School of Anatomy, stemming back to William Hunter in 1746 and in the main succeeded by the Middlesex Hospital Medical School, with which Bell became so intimately associated. The background of London of the Regency is etched in and some of the illustrations heighten the effect.

In 1836 Sir Charles Bell, renowned anatomist, surgeon and teacher, Gold Medallist of the Royal Society and Surgeon to the Middlesex Hospital since 1814, accepted at the age of 62 the Chair of Surgery at the University of Edinburgh. Although he rejoined many old friends and the scenes of his youth it was something of an autumn return. Edinburgh was changed and he had to compete in consultant practice with those intrepid surgeons of that time, Lizard, Syme, the great Liston and the young Ferguson. He died in 1842 without recouping his fortunes.

Of special interest to Army readers is Bell's stature as a military surgeon to which he had some claim but could scarcely compare with Guthrie, who had many years of surgery on active service. Bell visited Haslar in January, 1809, and made some beautiful illustrations of wounded soldiers there from Corunna. In 1814 his *Dissertation on Gunshot Wounds* was published. He visited Brussels and Antwerp in June, 1815, advised, operated upon and made illustrated notes on many who had been wounded two weeks before at Waterloo; there, incidentally, he discussed air embolism in wounds of the neck with the great Baron Larrey.

A number of Bell's superb drawings and paintings, including some of our treasured Waterloo drawings from the Royal Army Medical College, are reproduced. Sir Thomas Longmore's description of these as well as letters from Army surgeons concerning the patients is given in the Appendix. This also deals with other fascinating details, including Bell's addresses on the opening of London University and of the Middlesex Hospital Medical School, notes on cases of Bell's palsy, and on the Resurrectionists (with a fee book included). There is a revised and full bibliography of works by and about Bell. What a fertile pen he wielded! Textbooks on hand surgery are fashionable now and it is interesting to read that his *Bridgewater Treatise on the Hand* appeared in its ninth edition as late as 1874, more than thirty years after his death, and that his classical *Anatomy of Expression* was reprinted until 1893.

It is fitting that a surgeon anatomist who has also served the Middlesex Hospital long with distinction and added lustre to the land of his birth should have collaborated so happily with Professor Walls, a fellow Scotsman whose first predecessor at the Middlesex School was Sir Charles Bell. We are indebted to them and to the publishers for a handsome and memorable volume. J. H.

THE MEDICAL ANNUAL (76th issue). Edited by Sir Henry Tidy, K.B.E., M.A., M.D. (Oxon), F.R.C.P., and R. Milnes Walker, M.S. (Lond.), F.R.C.S. Bristol: John Wright & Sons Ltd. 1958. Pp. 580+xl. Illustrated. 42s.

Radical changes in the arrangement of the 76th Edition of this book of

reference have greatly simplified its use. Whereas formerly diseases were arranged alphabetically, now the reviews of each speciality subsection are grouped together. Thus, the task of getting abreast of the year's work in a particular field is made much easier.

In the principal section acknowledged authorities review the year's literature covering thirty subsections, the important papers on each being woven into a comprehensive and readable whole. There are four special articles. One on intersexuality summarising present knowledge of this complex subject ; one on wound infection in operating theatres ; a third on the dangers of the medical use of X-rays and the last on pædiatrics, in which advances have half emptied the wards.

A comprehensive list of English and American works published in the preceding year, arranged under the different subjects, and a useful list of pharmaceutical preparations and surgical appliances are also given.

It is an excellent production in the finest tradition of this well-known publication which saves so much drudgery.

M. H. P. S.

MEDICAL HISTORY OF THE SECOND WORLD WAR (Army Medical Services, Campaigns, Vol. II). By F. A. E. Crew, F.R.S. London : H.M.S.O. 1957. Pp. 537+xxxvii. Illustrated. 20 plates. 84s.

This volume is one which may be read with interest not only by medical officers but by professional and lay men, Service and non-Service alike, and indeed it has already attracted much attention in the Press.

It is well balanced in that it commences with the high tragedy of Hong Kong and Malaya and finishes with the triumphant conclusion of the North Africa campaigns. The garrison of Hong Kong, which was doomed from the first, had only a short campaign, but this is fully covered.

Much has been written of the "Singapore Incident," and to those of us who went into captivity Professor Crew's volume must evoke some poignant memories. Added to the frustration of being taken prisoner, our forces suffered much from ill-advised broadcasts which were listened to surreptitiously—not that these needed any clandestine hearing as they were joyfully relayed to us by our captors as a badge of our shame. Those that returned were perhaps over glamourised, but Professor Crew has placed the whole affair in its true perspective with admirable impartiality, and it is hoped that after the official histories have all been published, historians and novelists alike will forget it all and close the episode. Like the Gestapo, the Kempitai will never be forgotten, but it must be remembered that our captors treated us as they treated their other slaves and "inferior persons," and on this will posterity judge them.

As Professor Crew is the first to admit, as a result of difficulty in keeping and saving records there is inevitably much that is missing or inaccurate. For example, the sufferings, trials and tribulations of "F" Force are fully and rightly described, because owing to devoted record-keeping the facts are known. It must not be overlooked, however, that numerous small forces, too little to have

names, underwent similar hardship, and indeed there are medical officers to this day whose fate is still unknown.

The campaigns of Libya and North-West Africa are splendidly recounted, with all the difficulties of medical cover in a constantly shifting scene, painstakingly and accurately described. Perhaps in at least one instance geography is not quite accurate, but that is a very small criticism.

The development of the then infant Psychiatric Service is particularly well told and there is a small section on Pathology and Blood Transfusion. There is also a brief description of the medical set-up in Iceland and the Faroe Islands.

This is indeed a most absorbing volume.

L. R. S. M.

THE ISLAND CAMPAIGNS OF AUSTRALIA IN THE WAR OF 1939-1945. Vol. III of Series Five (Medical). By Allan S. Walker, M.D., Ch.M., F.R.A.C.P. Adelaide: Griffin Press. London: Angus & Robertson. 1957. Pp. 426+xvi. Illustrated. 35s.

In this, the third volume of the history of the Australian Medical Services in the war of 1939-45, the author completes the history of the Australian Army Medical Corps and covers the campaigns in New Guinea, the Solomons and Borneo.

What chiefly strikes the reader are the appalling conditions of terrain and climate under which these campaigns were fought. Of all the theatres in which the Commonwealth was involved this must have been the worst. The author has written a concise and clear account of the operations and has touched on many vital lessons which were learnt, so that the whole volume is a mine of medical information and therefore of corresponding value to the military doctor.

In a brief review such as this only one or two points can be noted. The field ambulance emerges once more as the "Queen of the Medical Battlefield," and one notes over and over again how this unit could be adapted to a hundred and one tasks and cope with them all. As might have been expected, the author has a lot to say on malaria and its prevention—the key to the latter being good individual anti-malarial discipline.

The book is excellently produced with clear print and good photographs and maps. For future editions it is recommended that scales be shown for the maps on pages 10 and 16. In short this is a volume that can be most strongly recommended to all medical officers because of its great value in showing how every obstacle of terrain, climate, disease and a tenacious enemy could be overcome with the minimum of resources.

A. M.

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CONTENTS

	PAGE		PAGE
CLINICAL COMMUNICATIONS		A Case of Surgical Emphysema Following Dental Extraction. By Major G. H. Carriett, R.A.M.C. 84	
Exercise "Medical Meilanion." By Major-General F. M. Richardson, D.S.O., O.B.E., Q.H.S., M.D. 49		The First Field Dressing. By Major-General R. E. Barnsley, C.B., M.C., M.B. 85	
Malaria Control by Residual Spraying Reinforced by Short-Term Chemoprophylaxis. By Major M. A. C. Dowling, M.R.C.S., D.P.H., D.T.M. & H., R.A.M.C., and R. D. Hughes, Ph.D., B.Sc. 61		The Treatment of Non-Gonococcal Urethritis with Spiramycin (Rovamycin). By Lieut.-Colonel B. Levy, M.B., R.A.M.C. 87	
An Outbreak of <i>Clostridium Welchii</i> Toxin Food Poisoning. By Major J. G. P. Power, M.B., D.P.H., D.T.M. & H., R.A.M.C., and Lieutenant H. Lister, M.B., B.S., R.A.M.C. 71		Correspondence—Lung Resection for Tuberculosis. By Lieut.-Colonel J. Mackay-Dick, O.B.E., F.R.C.P.(E.), R.A.M.C. Viral Encephalitis. By Lieut.-Colonel W. G. Macfie, M.R.C.P.(E.), R.A.M.C. 89	
Respiratory Signs and Symptoms in Young Soldiers and Their Relationship to Smoking. By H. J. Liebeschuetz, M.A., B.M., B.Ch. 76		BOOK REVIEWS 91	
Traumatic Effusion of the Knee : A Discussion. By Captain K. Norcross, B.M., R.A.M.C. 81		EDITORIAL NOTICES 96	

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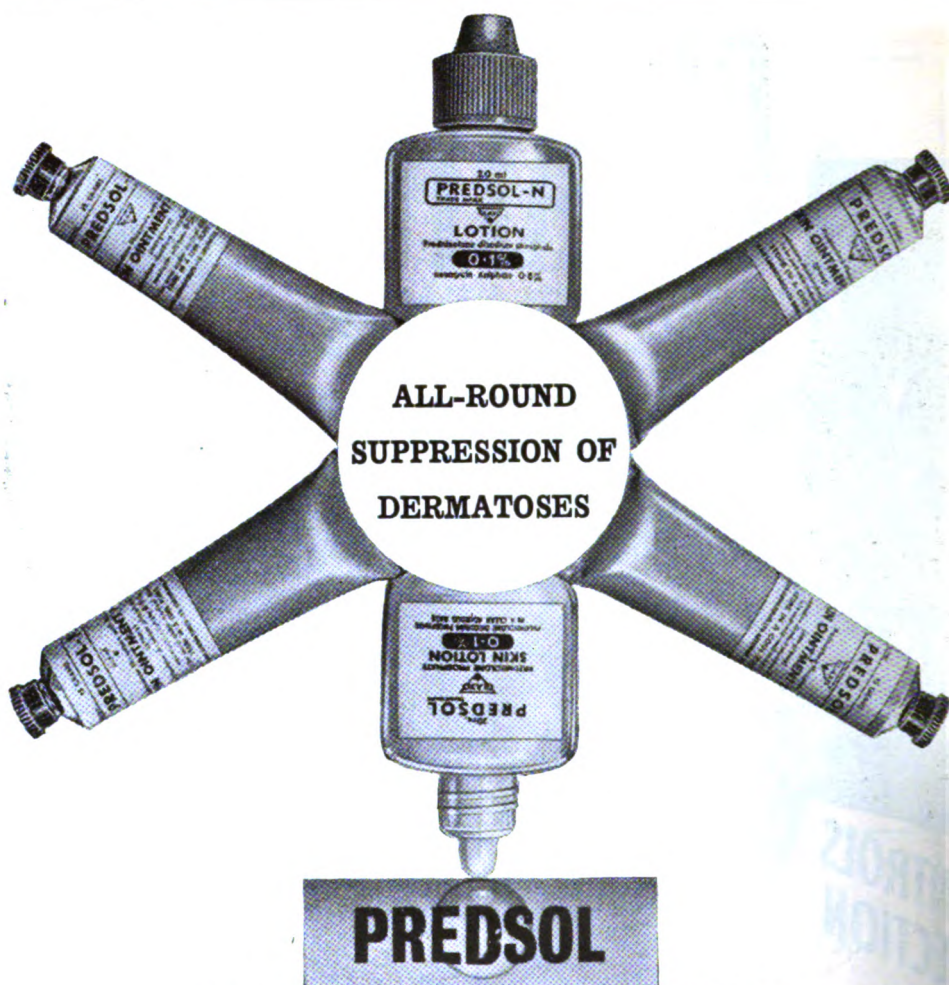
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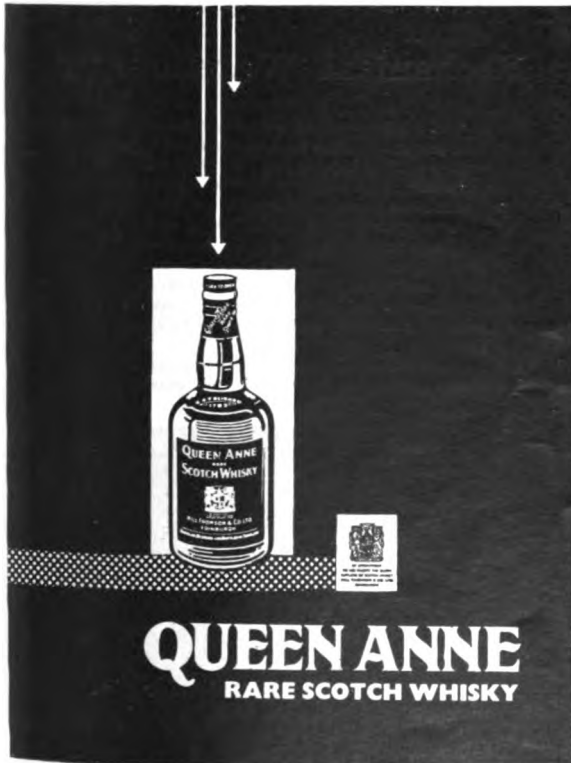
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EXERCISE "MEDICAL MEILANION"

BY

Major-General F. M. RICHARDSON, D.S.O., O.B.E., Q.H.S., M.D.

PEOPLE attending recent D.G.'s exercises have often wondered if the impressive standards could be kept up, and there were rumours that 1958 would see a utility production. But Colonel T. M. R. Ahern can trot happily off to the land of Mr. Cecil B. de Mille knowing that in this field he has few equals.

"Meilanion" successfully and dramatically brought us up to date in the progress towards preparedness for nuclear war which the D.G.'s team have been able to demonstrate in his previous exercises, and it added a worthy name to the roll call of fine exercises interestingly described by Colonel Ahern in the Diamond Jubilee number of this Journal. I was glad to see an amendment in the October number restored the name of "Horatius" to the list. In my account of "Royal Road" I mentioned Sir Arthur Porrit's address at "Horatius"—"a lantern to light the military surgeon's path." (1)

It was then also that I first heard a voice ring out at Mytchett which rang again at "Meilanion"—a positive carillon—Colonel Crosse. At "Horatius" he was not only a campanologist but a speleologist, as he stumped through that wonderful underground A.D.S. which he had designed. It was at "Horatius," too, that most of us first met General Fasting-Hansen of Denmark and General Dale of Norway, who were at Mytchett again for "Meilanion."

For the first time our visitors included the D.G.M.S. of Yugoslavia and the Consulting Surgeon of the Yugoslav Army, and Brigadier Hesselblad of the Swedish Defence Medical Board. Our Director-General's long-standing friendship with General Nikolis and Colonel Papo, who incidentally was one

of the D.G.'s officers during the war, was illuminated by an amusing incident at the Q.A.R.A.N.C. Preliminary Training School, where General Nikolis pointed out that Yugoslavia was coloured on the Information Room map as a Soviet satellite. Our D.G. demanded a coloured pencil and corrected the map to illustrate that country's sturdy independent status.

General Hayes, Surgeon-General of the United States Army, came again with some of his officers, and there were representatives from India and Pakistan, from the Royal Navy and Royal Air Force Medical Services, the Ministry of Defence and various War Office branches and directorates. History was made by a brother and sister attending—Colonel Raven, whom we all knew well, and his sister, Miss K. A. Raven, who is Principal Nursing Officer of the Ministry of Health.

Once again the name of the exercise was drawn from mythology, and when I first heard it I just couldn't think who or what Meilanion was, and neither could the Chief Education Officer in Germany. Knowing what army clerks can do, could it be a misprint for Millenium? No, because, although the D.G. insists, like Scharnhorst, that we must always "stand at the head of progress," he would never suggest that we had reached the end of it. Could the chap be the only survivor of the heroes of Thermopylae? Obviously not. Recent progress in the Army Medical Services training entitles the D.G. to claim that significant steps have been taken towards a great increase in the numbers who would survive atomic attacks.

Here is what the programme said about Meilanion :

"Meilanion accepted the swift-footed Atalanta's challenge to a race. Although it was a foot and not an arms race, Meilanion knew that not only was the penalty for losing certain death, but also that he lacked resources required for success. Therefore he devised certain procedures to lessen the odds against him, and took steps to obtain the necessary special equipment. Golden apples were acquired from the Hesperides and the astute use of them more than neutralised Atalanta's greater physical resources. Thus he was able to accomplish a task which had at first seemed impossible."

On a magnificently painted proscenium against a sombre background of hoplites, chariots, and so forth shone the bright figures of Atalanta, reining back in alarm from the first 20 KT golden apple, and Meilanion still well in the lead. Oddly enough, their clothes were made of exactly the same material, a sort of mythological P.T. kit, and as Meilanion had nothing on above the waist, and Atalanta apparently very little below, ribald speculation as to the object of the chase was inevitable. Mytchett in October is not the place for those unidentifiable but undeniably scanty coverings for which the Greeks probably had a word, so Meilanion had been allowed to grow old, and, suitably robed, he made occasional appearances to admonish the audience, and even the directing staff, with that freedom which is always allowed to these distinguished shades at Mytchett.

But now I must be very careful what I say because two of my careless comments on "Automedon" seem to have been overheard at very high levels, with

unhappy results. First the weather, for which I gave thanks last year, did its best to spoil some of this year's outdoor demonstrations with ill-timed deluges. Then on a slightly lower level my incautious remark about the absence of pre-exercise study seemed to touch off deluges of paper, equally ill-timed since the last few showers occurred at the height of the leave season. But these papers were so interestingly written and so important to our planning for the future that I positively welcomed this *unterpapierebeerdigung*. (Don't look it up. I invented it and wanted to share it with you. I hope it means "burial beneath paper.")

So there were few who had not already put in some hard thinking when, after the D.G. had welcomed the very representative audience which he had assembled, the Inspector of Training and the Commandant explained the object and setting of the exercise. Once again we were studying the shape of the field medical organisation of the future against a background of a limited war. As tactical and logistical doctrines for the future gradually "firm up," so it is slowly becoming possible for us to decide what may be the best shape to adopt before the jelly is allowed to set. And there are signs that we may have a homogeneous jelly rather than a trifle with unidentifiable bits and pieces embedded in a spongy matrix—units whose names and functions must be learned anew by the long-suffering staff. Jelly has a measure of flexibility, and perhaps when the final recipe is determined—transport and equipment equal to the task being added—it may have the tough, rubbery texture unpardonable in that dietary disaster of schooldays, blanc-mange, but essential in a structure which must bear the unpredictable stresses of nuclear war. The sub-unit with which the structure will be built is the field medical company, which looks like being the best method of making full use of what medical manpower is likely to be available; and, of course, to deal with the anticipated task some increase in manpower seems to be inevitable. It was proposed that field ambulances and F.D.Ss. with suitable differences in headquarters, which would include transport, should have two companies and C.C.Ss. four. The field medical company is less suited to the function of general hospitals, but it was suggested that one company should be incorporated in each hospital to increase their adaptability to the part which they would have to play in helping to deal with heavy casualties in their vicinity.

Possible methods of deploying such units in the combat zone and rear areas were demonstrated and discussed; and an interesting idea put forward by the directing staff was that, as base areas would certainly be subjected to heavy atomic attacks, hospitals should not be located there but in the communications zone where greater dispersion might be possible. Base areas would be allotted a suitable number of C.C.Ss. for their medical cover and their hospital cases would be evacuated forward into the communications zone. I was one of those who felt that some fallacy might be lurking here, though I remember propounding during Exercise "Avernus" the need to think in terms of what I then called the "two-way flow" conception of evacuation. However, this is not the place in which to develop these arguments, which will be analysed in the official

report on the exercise where you will be able to read about the discussions. One of the liveliest sprang up rather surprisingly on the subject of who should do the sorting of casualties in a general hospital. In the exercise as a whole there was valuable discussion, but I felt that it was a pity that there was not quite enough time for discussion of Problem I, and that a few senior officers were asked for their views instead of opening the subject to the general debate which I could feel seething under the surface, ready to burst forth like a volcano, or rather like a series of geysers all over the gymnasium.

I know from experience on the directing staff of four exercises how difficult it is to fit everything in and to find enough time for discussion. The D.G. of my day was always afraid of discussion "petering out" if too much time was allowed; and indeed there have been occasions when instead of the cleansing gushes of geysers we have had the lazy borborygmic bubblings of marsh gas from a stagnant swamp. But with a gathering of doctors I would always be prepared to take a chance, and on this particular occasion I think that a geyser or two could have profitably spouted instead of the brief serial in which Lieut.-Colonel Mackay-Dick had his leg gently pulled, and we weren't quite sure if ours were being pulled also.

Perhaps the directing staff thought that we ought to be compelled to spend more time on the most important and far more difficult problems of the communications zone and base. The problems of the divisional and corps areas are bound to be more simple, largely because in real war many factors limit our field of choice in deployment of medical units. But most of us having spent our war in these areas, we feel a special interest in their problems, and of course love of the field ambulance is a Mytchett tradition, and allusions to the "fairy princess" a recurrent theme song. Well, she didn't really start life as a fairy at all, and to get the record straight I might explain that it all began with the following introductory remarks to a serial in "Cambyes":

"It is traditional in medical exercises that when the words 'Field Ambulance' are uttered the most comatose officers are stimulated into a watchful vigilance.

"On all sides of the room crouch the dogs of war emitting low growls of disagreement. A little mangy perhaps some of them—and rather inclined to curl up in a warm basket—but all, like the faithful Gelert, ready to spring upon any brigand who should lay a finger on this little princess of medical units.

"So this serial—and any parts of our demonstration touching on field ambulances—are offered as incentives to former field ambulance C.Os. to gather in bars and explain to one another, or to any others who will listen, how much better they did it themselves."

Prolongation of the discussion of Problem I would have made us late for our meeting with a real V.I.P. the roar of whose arrival shook and deafened us in the gymnasium—the Fairey Rotodyne presented to us by its designer, Dr. Hislop. The capabilities of this amazing new aircraft in transporting personnel and equipment were demonstrated, and in contrast beside it on a lorry stood the Fairey ultra-light helicopter which a real reporter described as "a tiny bubble of a machine that appears to be hardly big enough for the pilot,

but it has room to take a stretcher case." As an indication of the need to make the greatest use of women in war, the field medical company which had been brought in in the Rotodyne consisted of members of the Q.A.R.A.N.C. who marched smartly past us headed by Major Miss M. Munro, R.A.M.C. This was an excellent curtain-raiser to the afternoon's outdoor demonstrations, which have been described by many experienced reporters in glowing terms which must have helped to impress on the general public the importance of our work and the great strides which have already been taken.

As we approached the demonstration site in Happy Valley a fine mushroom cloud was rising over it. Heavy casualties had been caused in a rifle company moving forward past the dug-in positions of H.Q. Company. These positions, which lay before us, had not escaped damage, and the R.M.O. and his R.A.M.C. sergeant had been killed. But a most efficient R.A.M.C. corporal survived and, together with the stretcher-bearer sergeant, dealt expertly with various casualties and set the uninjured to work at first aid. An ultra-light helicopter soon arrived on a reconnaissance flight and took away one stretcher case; and later four Whirlwind helicopters, making twelve flights in all, ferried in two field ambulance sections with equipment, including shelters. Reinforcement of the R.A.P. survivors achieved, casualty sweeps were soon in progress, first aid being given by R.A.M.C. men before the surviving riflemen carried the casualties to the C.C.P. Some casualties were evacuated in the later flights of the cargo-carrying Whirlwinds, and later evacuation was speeded up by the arrival of four more Whirlwinds adapted to take six stretchers, or four with some sitting cases or attendants. Within half an hour the local situation was well in hand, and now a field surgical team and some half a dozen extra nursing orderlies were seen arriving in the middle distance by the method of "ropeing down" from helicopters, which is used when conditions prevent the aircraft from touching down. These reinforcements came from 44 (Para) Field Ambulance, T.A., and later in the exercise members of that unit, led by Lieut.-Colonel Urquhart, their C.O., demonstrated this method in greater detail, and we also saw them performing the Twenty-Four Procedures in a C.C.S. with great efficiency. The Fairey Rotodyne flew over Happy Valley as a final reminder of the really golden possibilities of the future. From the moment of our arrival there was always something new and interesting happening, and the bustling pace of these events prevented the rain from depressing us. We then went to see an A.D.S. functioning in the "filter" or casualty sorting role; everything reduced to simplicity and directed to a rapid turn-over as casualties were arriving at a rate of some 240 an hour from a near-by nuclear incident from which 1,000 survivors had to be evacuated. The layout of the reception shelter and the drill for rapidly passing through the casualties whilst medical officers assessed them were simple but ingenious and will, I hope, be shown diagrammatically in the exercise report. Efficient work was being done in this A.D.S. by officers and N.C.Os. of the navy, army and air force of Norway and Denmark, and by R.A.M.C. apprentices under C.S.M. Wright, the son of a serving R.A.M.C. non-medical officer, who was a credit to his corps, his parents, and the training

which he had received. Procedure training, incidentally, was ably demonstrated during "Meilanion" by such widely divergent types as "young men and maidens"—R.A.M.C. apprentices, W.R.A.C. and Q.A.R.A.N.C. O.Rs., some of whom had not seen a patient a week or so before—by Scandinavian allies who mostly spoke good English, and Gurkha combatant soldiers (recently patients in the Connaught Military Hospital) who mostly did not, and by T.A. soldiers. Their conduct supported all that Lieut.-Colonel Brett had told us about the interest and enthusiasm aroused by this training in the experienced and inexperienced alike.

The Q.A.R.A.N.C. medical company which had arrived in the Rotodyne and the paratroopers' surgical team were seen at work in the medical company of a C.C.S. in another part of this afternoon's display; and the final scene near the tea tent was a proposed field hygiene organisation to provide small units which could deal in an advisory, and also in a practical, capacity with the many health hazards of the nuclear battlefield.

Wonderful hopes for the future were stirred up by the sight of helicopters giving what Colonel Ahern called "door-to-door casualty service," by the evidence of how quickly the great majority of untrained people can be made into reliable medical auxiliaries, by dreams of the new medical units in which they will serve, using the many kinds of modern light-weight equipment which we have recently been shown at Mytchett, and the new casualty rations which were shown this year. The D.G. himself has said that we must take our motto from Sir William Slim's words in "Defeat into Victory," and must no longer go "jogging along the highway" but "over the hills and fly away."

We are pressing forward to the day when our outmoded equipment can go to the sign of the three brass balls, never to be redeemed, and we can equip ourselves at the sign of Meilanion's three golden apples.

After I had said in one of the discussions that we must keep enough ambulance cars even in the helicopter age, and the D.G. had shot that one down by asking if I wanted to go back to the bullock tonga, someone said that I might have replied that these had served Wellington very well. So they did, and the incessant shrieking of their ungreased wooden axles seems to have been the most universally vivid memory of the war to Peninsular veterans. But the sufferings they inflicted on the wounded were appalling. Sergeant Donaldson describes it as "excruciating torture" (2); and the French, despite Baron Larrey, seem to have been no better off. An anonymous Saxon rifleman, *der junge Feldjäger*, who served under Napoleon and, after capture in the Peninsula, under Wellington, says: "No one felt the inconvenience of these carts more than the sick and wounded, who . . . in addition to their bodily suffering had to endure this abominable noise for five or six days together." (3)

In its advocacy of the maximum use of helicopters "Meilanion" was preaching to the converted. This aircraft is firmly fixed in the popular mind as the modern medical magic carpet, and if the casualties of any future war should be deprived of its life-giving advantages the public and the Press would very rightly execrate anyone who was responsible. But even when we have all the helicopters, and

the aircraft of the Prestwick Pioneer type (STOL), that we need, there will be, in a European theatre especially, many occasions and perhaps days on end when for various reasons, mainly weather conditions, flying will be impossible. I would suggest that these limitations on flying may be increased by the fog of war likely in certain meteorological conditions to hover over the nuclear battlefield. The weather is noticeably affected by the smoke of the Ruhr which often precipitates local fogs. London's "smog" is notorious. Although the occasional nuclear test may not affect the weather, and although it may be usual for the mushroom clouds to rise rapidly to great heights and be carried away by high wind currents, I wonder if any meteorologist would deny the possibility that the nuclear battlefield may often be a smoggy spot. The faithful ambulance car nosing its way through mists and mud will still have a part to play.

Outside the main theme of the exercise were some splendid professional contributions, and one on the fringe between the professional and the administrative—a graphic account of the Lewisham train disaster by Lieut.-Colonel Lerman, A.E.R., who is consulting anaesthetist to the Lewisham group of hospitals.

After a talk by Mr. Ainsworth, from Porton, on the ballistics of bullet wounds, Colonel A. G. D. Whyte and Lieut.-Colonel J. M. Matheson described the really alarming effects of modern high velocity weapons such as the F.N. rifle. The equally alarming subject of the great amount of whole blood which would be needed in war and the methods by which those needs may be met were brought home to us by Mr. Ruscoe Clarke, of the Birmingham Accident Hospital, and Dr. Maycock. Mr. Clarke's lecture will be printed in the *British Medical Journal*, and I am sure that anyone who heard him at Mytchett will read this and any subsequent papers by him, and that, whilst reading, they will hear in imagination his impassioned evangelistic voice. During one of the discussions he echoed Mr. Lewin's plea of last year that surgeons in war should above all be general surgeons. Something which Mr. Clarke said in his lecture reminded me of an aphorism of Sir Heneage Ogilvie that "casualties have survived after lying out all night on an ice-bound battlefield who might have died if they had been recovered earlier and been subjected to the additional trauma of movement." Medicine, Pathology, Virology and Army Health were most ably represented in a symposium on viral encephalitis by a team led by the Commandant of the Royal Army Medical College—Colonel Carmichael, Lieut.-Colonels Wood and Lewis and Majors Bryan and Hart. Lieut.-Colonel Wood, who was in jungle green, had just arrived from the Far East and neatly excused his inappropriate clothes by saying that in these days of air travel an officer was more often accompanied by his virus than by his valise.

General Hughes had every reason to be proud of his team. This was one of the finest professional presentations which has been heard at Mytchett, and earned the adjective "brilliant" from the *Lancet's* Peripatetic Correspondent (4). A passing reference to the long-outmoded term "P.U.O." touched off a violent diatribe by Brigadier Curran, who vigorously underlined the need for prophylactic inoculations against yellow fever in such places as Malaya. As he

admonished all and sundry in his best rumbustious manner, regular exercise attenders will not need to be told that he earned rounds of applause and laughter. His contribution was nicely referred to by the Peripatetic Correspondent as "the lengthiest question I have ever heard asked at a medical meeting."

I am afraid that this splendid symposium also touched off the longest divagation into history so far inflicted upon readers of these accounts of D.G.'s exercises, because it made me wonder if malaria was really the only cause of all that terrible Walcheren fever which in 1809 wrecked what Sir John Fortescue called "incomparably the greatest armament that had ever left the shores of England" (5). High hopes were raised. Roughly handled by the Austrians, who had inflicted 20,000 casualties upon him at Aspern and Essling, Napoleon and his army were on the island of Lobau, where they had to skulk for over a month. Oh for just one 20 KT missile! Think of it—no Borodino or retreat from Moscow; no Leipzig; no Waterloo. But of course it would have been sad to displace what glamour still draped the horrors of their battlefields by the terrors and mathematical torments and templates of today.

By the time the expedition sailed Napoleon had extricated himself, and had won the battle of Wagram. Poor old Britain was "entering the Continental arena just as every one else was quitting it" (6). All the same in resolute hands, with better secrecy, and better luck with the weather, Antwerp might have been taken and great damage done to the French cause. A few weeks later Wellington had withdrawn after his victory at Talavera,* Austria had made peace, and the great expedition had been evacuated—what was left of it. Of the original 40,000, 35,000 survived but over 11,500 were in hospital. The enemy had killed 106 men, and Walcheren fever 4,000. Of course, it was a pity that the doctors were not consulted during the planning of the expedition. But even if they had been, even if they had seen the report of "two confidential persons" about the prevalence and deadly nature of the fever, they would probably have contributed very little, to judge from their deplorable evidence before the parliamentary committee of enquiry (7), and from the fact that throughout the campaign the Medical Board—Physician-General, Surgeon-General, and Inspector-General of Army Hospitals—never once met to discuss the losses from sickness. One member, Sir Lucas Pepys, refused to go to Walcheren, excusing himself with the memorable phrase that "he knew nothing of the diseases of the soldier." He was the Physician-General. Another, Thomas Keate, made a good initial impression at the enquiry, being confident that preventive measures could have been taken if the doctors had been consulted. But when questioned about these measures he could only answer lamely; "Medicines that might have been administered for preventing the ill effects of the disease by the season, such as Sir John Pringle describes; which I do not recollect exactly." Later he admitted that he knew nothing of fevers "as a surgeon." Fair enough—he was the Surgeon-General; but it was to him, when the Board could agree about nothing, that the full medical responsibility for Walcheren had been entrusted by the Commander-in-Chief, Sir David Dundas. "Old Pivot" himself was not too hot at the enquiry, and when he was questioned about the methods of planning such an expedition he answered, "I cannot say; I am so young in command that I have not had a great many opportunities of having these points discussed." When he said this he was 76 years old, and had been Commander-in-Chief for eleven months. He had commanded a formation equivalent to a corps at the Helder in 1799. The third member of the Medical Board, Francis Knight, the Inspector-General of Army Hospitals, had been mainly responsible for the dissensions in the Board; but in his evidence he sounds the most convincing of the lot, and one of his points has a

* He left some 4,000 wounded to fall into the generous hands of a chubby ex-drummer boy, Marshal Victor. They were in the care of volunteer doctors under Summers Higgins, and their gratitude to him is attested by the fine Talavera cup in the officers' mess at Millbank of which we are very proud.

familiar ring today. This was the difficulty of getting enough junior medical officers for Walcheren, and other theatres including Portugal, Sicily, and the West Indies. Asked if better pay would have eased the difficulty he doubted it, and said, "I think there are many other considerations which weighed against the obtaining a sufficient number of inferior medical officers."

Although the future Sir James McGrigor was sent to Walcheren in October, and is rightly described by Sir John Fortescue as being "very efficient and energetic," (5) his evidence is not recorded in the official report; which is perhaps just as well, as in his autobiography he admits that he became hopelessly muddled and lost the thread of his argument. That seems to end our only hope of guessing if perhaps some virus, as well as the rightly convicted protozoon, might have been at work in Napoleon's interests. The last word may be given to Mr. Samuel Whitbread, M.P., in the final debate: "Sent to inevitable sickness, even in that sickness our poor soldiers were neglected. Who could wonder at it when they recollected the ill-constituted, ill-arranged, and ill-digested Medical Board (Hear!). Their head, Sir Lucas Pepys, said what he meant by the investigation of camp and contagious diseases was the inspection of hospitals. He might just as well have said the way to judge of diseases of the foot was to look into a pair of cast-off boots (Hear! Hear!)." The redoubtable Mr. Whitbread also had a crack at Mr. Canning and at General Crauford, who took part in the debate. It is an interesting sidelight on those days that "Black Bob" who, on the day on which the expedition sailed, had been hastening to the field of Talavera with his Light Division, was able to leave the Peninsula to attend the debate whilst his division was holding a river line of more than forty miles. Perhaps it is hardly fair to give the very last word to an Opposition spokesman. In a *History of the War* by James McQueen published in Glasgow in 1815 before the Hundred Days, which is not so much a history as a contemporary pamphlet, full of blood and thunder, (8) Whitbread is scolded as one of those who were always ready, in Gilbert's words, to praise "every country but their own."

Thomas Keate wrote a long paper in self-justification, and really made out quite a good case for himself and the medical services in general; but rather sacrifices our sympathy by ending with the following snivel. "I am myself, however, conscious of nothing which ought in justice to deprive me of the credit and remuneration due to a long faithful and meritorious discharge of the numerous duties attached to the several appointments with which His Majesty was graciously pleased to honour me."

The production of the exercise was as smooth as ever, and Colonel Niven dropped a hint of the hard work which this involves when, as he drank his beer in a playlet set in a Middle Eastern bar, he said, "I say, this is the real stuff—not like all those wretched rehearsals."

It was said of the medical arrangements of Alamein that wherever a man fell a stretcher was waiting to receive him. At "Meilanion," whenever we had to walk a luxury coach was waiting. On the first morning in the one in which I sat some anxiety was aroused in other passengers by a notice reading "Introducing Frank, your courier-driver." Reassured by my refusal to take the wheel, they continued to shudder at the second notice—"Keep your feet off the Moquette."

These journal accounts aim at encouraging people to read the official report, so I will not summarise the lessons of "Meilanion"; but it will be evident from what I have written, and from the Press reports, that the exercise must have brought home to many more people than usual how far the Army Medical Services have progressed in preparation for the possibility of nuclear war. It

has often been said that chemical warfare was probably warded off largely by the completeness of our preparations to minimise its effects. We talk of the nuclear deterrent, and no one can pray more fervently than a doctor that it does indeed deter. By preparing for nuclear war we may be helping to avert it. Unlike a great deal of ordinary military training, very little of our medical training is wasted if war never comes, and we have a useful point here for recruiting propaganda. Just as in 1809, pay is not the only thing which counts in recruiting. Better pay and conditions help to get the bodies, but to capture their souls and to make them the kind of men we need the emotional appeal is important. Count Alfred de Vigny, who joined the French Royalist Army just before the Hundred Days, said that the soul of an army was the desire for military glory in battle, and he compared peace-time soldiering to the boredom of incarceration in the belly of the wooden horse, waiting to leap out in Troy. (9) The heavy casualties and muddy horrors of the First World War couldn't quite kill this spirit, and it must be admitted that there was much to enjoy in the last war, especially when periods of trial or long arduous defence were succeeded by victorious advances. Glorification of war has never been quite respectable in our country, but the veterans of many campaigns would not talk so much about them had not there been some secret intoxication. It is essential that we should continue to use the glories of our army's history to give men a proper pride in our military ancestry. Much more of this sort of approach is needed if we are to counteract the malign influence of the military mind which chose to signify that moment when a man ceases to have the honour of being a British soldier by the word "Release."

We are told that anti-army feelings in our nation may date from dislike of the military rule of Cromwell's major-generals. The British Public, which does like to be beside the seaside, never doubts that all the nice girls love a sailor. Sea-going heroes have always been popular. Who remembers any landlubberly leaders contemporary with Raleigh and Drake? The lovable emotional Nelson may indeed have been our greatest military leader, but if he had had the misfortune to survive Trafalgar, and Wellington the good luck to fall at Waterloo, who would be on the higher column? Earl Haig may have a somewhat stolid statue, but the picture of Lord Beatty, cap cocked jauntily over one eye, probably has more emotional appeal.

The last war began to redress the balance at last. Many generals have become positively glamorous figures; and many old campaigners have returned to civilian life with proud and happy memories of their army service. And why not? for after all in each one of them, and indeed in the most unwilling conscript, there must be the genes of Henry's bowmen, of Marlborough's and Wellington's men, of Scots and Irish soldiers of fortune who fought for Gustavus Adolphus, or for anyone who would use their swords. Of course, such military ancestry will not be denied, and we all know how interested our soldiers become in battle or manœuvres. They like to feel that they know what is afoot, and what the brigadiers and the generals are up to. Too often our old anti-army traditions lead them to suppress or to conceal their interest, just as the prep-school boy

would do anything not to be thought a "swot." But it is not too difficult to foster and stimulate in most of them an interest and pride in the great history and traditions of our Army. The Medical Services' share in that history is illustrated in our V.C. room and in the Depot museum; but it is not too difficult to appreciate the reactions in war time of a young man called up to defend his country when he was offered not a rifle but a bedpan. In due course he learned, perhaps by hard experience, that every man who lets off a rifle needs fifteen or more to supply and maintain him, and that of all these the R.A.M.C. must work farthest forward in the combat zone—the brightest feather in the administrative tail. Then, of course, he was able to understand the spirit of comradeship displayed towards its field ambulance by a brigade which has seen action—a spirit expressed in many war memoirs of the past, and notably in a book about the first campaign in which our Corps took part in its present form, written by a young subaltern of the 4th Hussars. (10)

Everyone knows that there would be very important work for us in Troy, and if our case is properly presented we should be able to convince potential recruits that life in the belly of the Wooden Horse need not be boring or unrewarding. There will always be a number of men who would have liked to become doctors, and who see in the R.A.M.C. opportunities for medical training which perhaps their parents could not afford to give them. But the majority are more likely to regard much of the training as women's work taught to them by women. When talking to our soldiers about their attitude to training I sometimes confess that I am sure if I had not myself wanted to be a doctor and had been called up for National Service in the R.A.M.C. I would have resisted N.O. III training to about my third company conduct sheet. But the threat of nuclear warfare has changed all that. Every man in the armed services must now be trained in first aid, and anyone with more advanced medical knowledge or skill in life-saving becomes a valuable member of any community, military or civilian. Their value to the civilian community deserves special emphasis. The soldier on the nuclear battlefield will never see the horrors which his ancestors saw on the battlefields of Marlborough or Wellington, or even those of the First World War. Dispersion alone will see to that. Civilian communities which cannot disperse or protect themselves in various other ways available to armies would unfortunately be called upon to endure far more than would soldiers. The 1951 D.G.'s exercise pointed the way to the protection of troops in the field from nuclear attack, and our Corps has played a useful part in that sphere ever since, whilst also actively studying how to adapt ourselves for our own particular role. The most significant step in the past two years has been the development of what for want of a better term we still call "Procedure Training," and its demonstration to a very wide circle of interested people, both military and civilian, in our own country and Commonwealth, and amongst our N.A.T.O. allies. "Meilanion" focused further attention upon it. Perhaps only those who know a little of India could grasp the full significance of this training being demonstrated by Gurkha soldiers, members of a race of warriors to whom soldiering is their life, almost their religion, and to whom nursing is

woman's work unfit for warriors. During "Automedon" we heard that a prominent authority on nurse training had said that we had trained the untrainable. Gurkhas are eminently trainable when they are interested, but these men had been trained, and it seemed inspired, without even the benefit of a common language. By training our men and women in this way, and by returning a number of trained people to civilian life to carry on the good work, we are doing work of truly national, and even international importance. We can feel proud of this and this pride may well help us to attract the recruits we need if we are to be enabled to continue to play a worthy part in the Regular Army of the future.

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MALARIA CONTROL BY RESIDUAL SPRAYING REINFORCED BY SHORT-TERM CHEMOPROPHYLAXIS

BY

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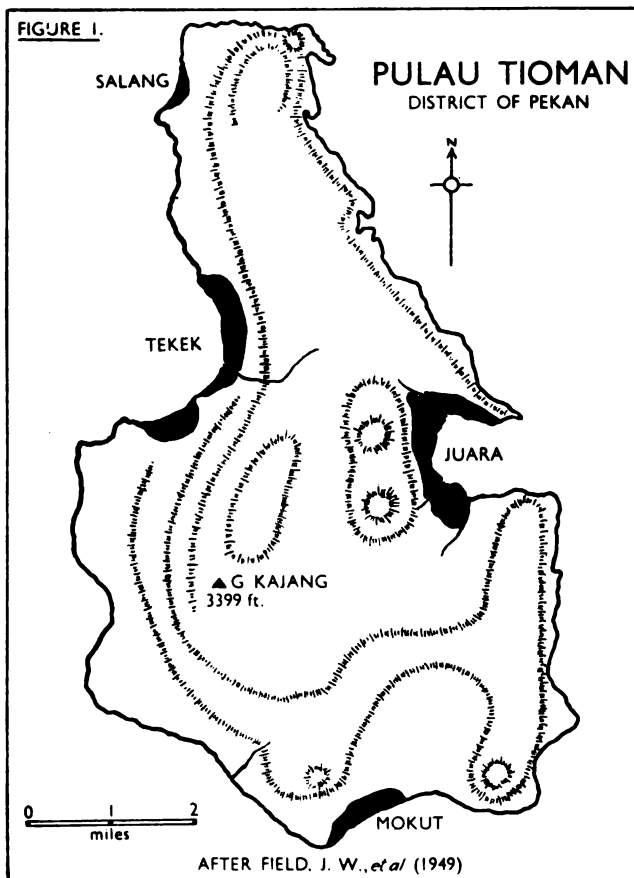
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INTRODUCTION

FOLLOWING the occurrence of a number of cases of malaria in naval personnel who had been ashore at Pulau Tioman, a survey of the island was carried out on 29th June, 1955, on behalf of the Royal Navy and with the consent of the Pahang health authorities, in order to estimate the degree of endemicity of the disease and to make recommendations for its control.



Pulau Tioman (see Fig. 1) is a small, densely forested island, fourteen miles long and six miles wide, lying in the China Sea at a latitude of $2^{\circ} 45' N.$, some thirty miles from the nearest point on the east coast of Malaya. The centre of the island is mountainous and the rocky slopes, clad in tropical rain forest, fall abruptly to the sea. At intervals, white beaches backed by narrow strips of sandy plain, seldom more than a few hundred yards long, provide clearings for the scattered villages with their plantations of coconut palm and tapioca. Two of these beaches, Tekek on the west and Juara on the east, with their fine sand and safe bathing, are used by the Navy for recreational purposes. The islanders, with an overall population of about 1,000, are Malays, probably originating from the mainland of Pahang by which the island is administered. Their livelihood is gained from fishing and the copra trade. Owing to the isolation of the villages by the steep, jungle-covered cliffs which surround them, there is little communication except by sea. A rough, tortuous mountain path, infrequently used, connects Tekek with Juara. There is a regular boat service between Tioman and Mersing on the mainland, so that a small amount of population migration takes place.

INFORMATION FROM PREVIOUS SURVEYS

A detailed malaria survey of Tioman Island was carried out in 1949 by a team led by Dr. J. W. Field, Acting Director of the Institute for Medical Research, Kuala Lumpur. The report* showed that the death rate at all ages was high, averaging about 30 per 1,000 per annum, and about 40 per cent of the deaths occurred in children below the age of five years. This mortality among infants was demonstrated by a random inquiry among mothers which revealed that less than half the children born to them had survived. Examination of the inhabitants showed a typical picture of hyperendemic malaria. A high spleen rate in young children with fever and stunted development gave place gradually to the healthy, immune adult little affected by the ravages of the disease. Unfortunately, the blood slides taken were contaminated by a spore-bearing bacillus so that no parasite rates were available, but Dr. Field considered the level of endemicity to be greater than he had seen elsewhere in Malaya. The presence of the notorious vectors, *Anopheles maculatus* and *A. sundaicus*, provided the probable route for this intense transmission of malaria, but they were not definitely incriminated by dissection.

MALARIA SURVEY, JUNE, 1955

Method

A team, consisting of a malariologist, an entomologist and three field assistants with a clerk-interpreter, boarded the frigate H.M.S. *Opossum* on 28th June, 1955. At dawn the following morning the team was landed with equipment at Tekek beach on the west coast of Pulau Tioman. A spleen and parasite survey was conducted in Tekek school and in the course of house-to-

* A copy of this unpublished report (*Malaria on Tioman Island*, by J. W. Field *et al.*), is available for reference in the library of the Royal Army Medical College.

house visiting, and in all 79 children were examined. Hackett's method was used for the measurement of spleen size. A smear and a thick drop of blood were taken from each child, and the liberal administration of sweets made an otherwise unpleasant visit a popular one. Meanwhile, the entomological team carried out a detailed ground survey for breeding and adult resting haunts of anophelines. With the help of the government dispenser, who had been notified in advance, two guides were secured to direct the team across the island to Juara by jungle path. The seven-mile route across a 2,000-foot saddle, covered in two hours, was a most interesting one, but the rigorous climbing involved allowed little time for appreciation. At Juara, a smaller village, only 41 children were examined and the coastal strip was carefully surveyed with a view to future control measures. At 1800 hours, H.M.S. *Opossum* picked up the team from Juara, returning them to Singapore the following morning, 30th June, 1955.

Spleen and parasite survey

The results of spleen and parasite rates in age group and sex distribution in the two villages examined are given in Table 1. The combined figures for

Table 1. *Results of the Preliminary Spleen and Parasite Survey in Pulau Tioman, June, 1955*

SPLEEN AND PARASITE RATES IN AGE-GROUP

Age group	Number of children	Spleen rate per cent	Average enlarged spleen	Parasite rate per cent
0-4	7	85.7	1.3	85.7
5-9	62	67.8	1.5	59.7
10-14	43	51.2	1.2	55.8
15+	8	37.5	1.0	37.5
TOTAL all ages	120	60.9	1.4	58.4

SPLEEN AND PARASITE RATES, MALES AND FEMALES

Sex	Number of children	Spleen rate per cent	Average enlarged spleen	Parasite rate per cent
Males	67	56.7	1.5	58.3
Females	53	64.2	1.2	58.5
TOTAL, both sexes	120	60.9	1.4	58.4

PARASITE SPECIES IDENTIFIED

(There were 70 positive slides, including 14 mixed infections)

Parasites	Number of cases	Proportion of positive cases (per cent)
<i>P. vivax</i> ...	58	82.8
<i>P. falciparum</i> ...	19	27.2
<i>P. malariae</i> ...	7	10.0

the whole survey, showing the diminution with increasing age of spleen rate, spleen size and parasite rate, provide striking proof of the gradual development of immunity in the population. Malaria, more intense in Juara than in Tekek, was nevertheless highly endemic in both villages. At the time of the survey there had been a drought for several weeks, mosquito population was at a low ebb and transmission had therefore been drastically reduced. The distribution of parasite species found on examination of blood slides, with the relative preponderance of *Plasmodium vivax* over *P. malariae*, was probably an abnormal one. This is borne out by the fact that *P. falciparum*, although quite commonly found, was only in gametocyte form. At the height of transmission, malignant tertian malaria might be expected to produce the majority of infections with the consequent grave risk to infants and immigrant non-immunes. Figs. 2 and 3 compare the results with Field's survey in 1949, and it can be seen that the position had not changed significantly during the intervening six years.

Entomological data

As already stated, the prolonged drought had been responsible for a considerable reduction in the mosquito population. Searches for resting adults and for larvæ were therefore disappointing, the latter being limited to the discovery of *A. aitheni*, a non-vector, along the banks of the fast-running streams which tumble along their rocky course to the sea. With the advent of the rains, however, the swelling of these streams would give rise to countless seepages on the granite outcrops ideal for *A. maculatus* breeding. In his survey, Field described the predominance of *A. sundaicus* and *A. maculatus* in night catches (observations which were confirmed on later overnight visits to the island). Field observed *A. sundaicus* breeding in the brackish water near the mouths of the streams, protected by the floating beds of green algæ. The scarcity of larvæ of this species during the present survey was probably the result of higher salinity caused by the drought.

However, even out of season a low-grade transmission of malaria must occur, as the degree of hyperendemicity shown by the findings of the survey can only be explained by a constant re-infection of the inhabitants.

Discussion

Two measures of control have been applied on Tioman Island in the past with little success. During the period 1937-1941, stream clearance and oiling were carried out in the Tekek and Juara areas by twelve labourers under the supervision of a *mandore*. A rapid survey made by Field in 1941, records of which have not survived the Japanese occupation, revealed a degree of transmission similar to that found in 1949. Although control of *A. sundaicus* could be effected by larviciding, many of the seepages which promote the breeding of the more dangerous vector, *A. maculatus*, would be quite inaccessible to the oiling gangs.

An experimental trial with paludrine was introduced in August, 1947, and the drug was distributed throughout the population for a period of eight months.

Shortly after the conclusion of this experiment, a survey of the malaria situation showed that little change had taken place. It is impossible to ensure, without careful supervision, that a prophylactic drug is in fact taken by the local inhabitants. This measure alone has proved disappointing in trials elsewhere in the world, except where the population at risk is a disciplined one, such as a school or labour camp.

In his recommendations for control, Field considered that a combination of drug prophylaxis and residual spraying of houses would give the best chances of success in conditions prevailing at Tioman. He emphasised that any break effected in transmission of malaria on the island would produce a gradual loss in immunity among the local population. It was therefore imperative that control, once established, should be maintained indefinitely or the inhabitants, deprived of their high tolerance to the disease, would fall ready victims to malignant tertian infection.

The concept of eradication of malaria by elimination of indigenous vector mosquitoes has proved itself to be an ideal, difficult if not impossible to attain. A prolonged break in transmission, however, has the effect of sterilising the human carrier population, and the phenomenon of anophelism without malaria is produced, as in Cyprus, Sardinia and elsewhere. This situation can be maintained easily and at low cost as long as there is continued vigilance to observe the early signs of reappearance of the disease. Today, with better education of the inhabitants, efficient vigilance by the dispenser, and the availability of effective drugs for prophylaxis and rapid cure of malaria, the recrudescence of the disease on the island could be immediately controlled.

RECOMMENDATIONS FOR CONTROL

The aim of control was to eliminate as far as possible the infected adult mosquitoes and to prevent sporogony in the survivors until the effects of residual spraying had become established. The following measures were therefore recommended for the control of the disease in Tekek and Juara :

Selective dispersal of residual insecticide by Swingfog

This had already proved itself to be an effective measure in causing the immediate reduction of the adult, and therefore the infective, part of the mosquito population. Dieldrin was the insecticide recommended, and the fog would be directed against outside resting-places of the anophelines.

Administration of curative and prophylactic drugs

An immediate, single curative dose of chloroquine, and a prophylactic dose of paludrine repeated once weekly for six weeks, would ensure the elimination of overt malaria in the islanders. It would also prevent sporogony in anophelines biting the inhabitants during the six-week period. The dosages recommended are given in Table 2.

Table 2. *Dosage of chloroquine and paludrine recommended*

Drug	Dosage for			Interval between doses
	Adults	Children		
		0-5 years	6-12 years	
Chloroquine ...	0.6 g.	0.15 g.	0.3 g.	Single dose only
Paludrine ...	0.3 g.	0.1 g.	0.2 g.	Once weekly for six weeks

Residual spraying of all houses and outbuildings

Unlike fogging and drug administration, residual spraying is not immediate in effect, but it would help to maintain the advantage gained by the other two measures. The insecticide recommended for use was dieldrin applied at a surface dosage of 50 mg. per square foot.

In order that these recommendations might be put to best effect to prevent the continual reintroduction of parasite carriers it was essential that the whole island should be treated simultaneously. The Pahang health authorities agreed to apply similar measures, with the exception of the fog dispersal, in the remaining villages of Mokut and Salang. The date selected for the combined control programme was the middle of September. As there were no local replastering customs to affect the insecticide deposit, the residual spraying would be exerting its maximum effect at the time of build-up of the anopheline population in November. Dieldrin with its low volatility should remain toxic to inside-resting mosquitoes throughout the peak months of transmission. A further spraying one year later could be relied upon to maintain the control, but as a safeguard a check survey should be carried out in May, 1956, before the end of the principal malaria season.

MALARIA CONTROL PROGRAMME, SEPTEMBER, 1955

The control recommendations were accepted, and the same six personnel embarked at Singapore on H.M.S. *Modeste* on 15th September, 1955, arriving off Tioman island the following morning. Half the team with supplies and equipment were landed at Tekek, and the remainder were taken round to the east coast and landed at Juara. The government dispenser and the Penghulu were most willing to co-operate and were jointly responsible for the effective weekly distribution of paludrine after the initial dosage. The importance of ensuring that there were no omissions from treatment among the local inhabitants was impressed upon them. A team from the Pahang Health Department arrived the following morning, having been conveyed across from Kuantan by light naval craft. The combined programme was carried out as outlined in the previous section.

With one Swingfog machine at Tekek and another at Juara, fogging was carried out in inversion conditions between 6 a.m. and 9 a.m. on two consecutive

mornings. The insecticide used was Dieldrex 15, an emulsion concentrate containing 15 per cent dieldrin, and a satisfactory wind drift permitted the treatment of the whole of the scrub and undergrowth between the villages and the rain forest. At one stage at Tekek there was a breeze off the land and the remarkable length of fog drift over water surface in the early morning was observed. The fog was seen and smelt by personnel on board H.M.S. *Modeste*, which was anchored three-quarters of a mile out in the bay. In thick scrub and jungle conditions, however, an effective drift of 150 to 200 yards was allowed with a control jet size of 0.9 mm. The remaining villages of Mokut and Salang were not treated in this manner.

The Penghulu arranged for a gathering of the local inhabitants, and the first dosage with chloroquine and paludrine at Tekek and Juara was personally supervised by the team. As a nominal roll of persons living in the island is held by the Penghulu, the treatment of absentees was made relatively simple. Vomiting occurred with chloroquine in about 1 per cent of cases, but they retained a second dose without difficulty. The Health Officer, East Pahang, Dr. F. X. Fernandez, supervised the administration of drugs in the rest of the island. Arrangements were made for a regular weekly dosage of the whole population with paludrine for a further period of six weeks. This programme was completed satisfactorily with the exception of Salang, where the sixth dose was omitted owing to a prolonged spell of bad weather.

Residual spraying of all houses and out-buildings in Tekek and Juara was carried out using dieldrin emulsion applied at an estimated surface dosage of 50 mg. dieldrin per square foot. No difficulties were encountered during this spraying, and the inhabitants were most co-operative throughout. The houses in the rest of the island were treated with B.H.C. wettable powder at an estimated application rate of 40 mg. gamma per square foot according to current practice in Pahang.

When the work was completed, the team embarked on board H.M.S. *Consort* (which had relieved *Modeste*) and returned to Singapore on 19th September, 1955.

FOLLOW-UP SURVEY, MAY, 1956

The survey team, with the addition of a pathologist (Captain M. S. Muir, R.A.M.C.), who took the blood slides and later examined and reported on them, embarked on H.M.S. *Newcastle* on 25th May, 1956. During the following two days, 127 children were examined and a general survey carried out to assess the effects of spraying. A civilian health team from Pahang made an entomological survey and also took blood slides from 24 infants under the age of one year.

In the Tables 3, 4 and 5 and in Fig. 2 it can be seen that there has been a marked reduction in spleen rate and size and in parasite rate as compared with the figures obtained at the first spraying. Of the 15 infants examined in Tekek and Juara by the civil health team, two showed positive blood smears for *P. falciparum*. One of these infants was, however, born during the spraying of

the island and the other two weeks later. It is certain therefore that neither of these infants would have received prophylactic drugs during the mass treatment and both were born before the residual spraying could be expected to exert its full control effect on the vector mosquitoes.

The team returned to Singapore on 27th May, 1956.

Table 3. *Comparison of results of Spleen and Parasite Surveys in 1955 (preliminary survey) and 1956 (after control)*

TOTAL FIGURES FOR BOTH TEKEK AND JUARA

Age group (years)	Spleen rates per cent		Average enlarged spleen		Parasite rates per cent	
	1955	1956	1955	1956	1955	1956 *
5-9	67.8	29.6	1.5	1.1	59.7	1.8
10-14	51.2	8.6	1.2	1.2	55.8	3.4
15 +	37.5	7.1	1.0	1.0	37.5	Nil
TOTAL, all ages	59.4	17.4	1.4	1.09	56.6	2.4

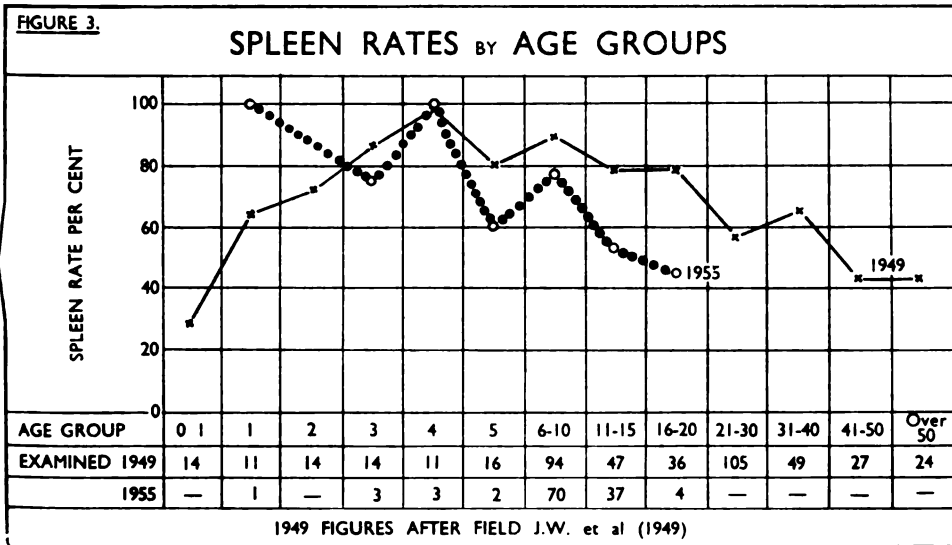
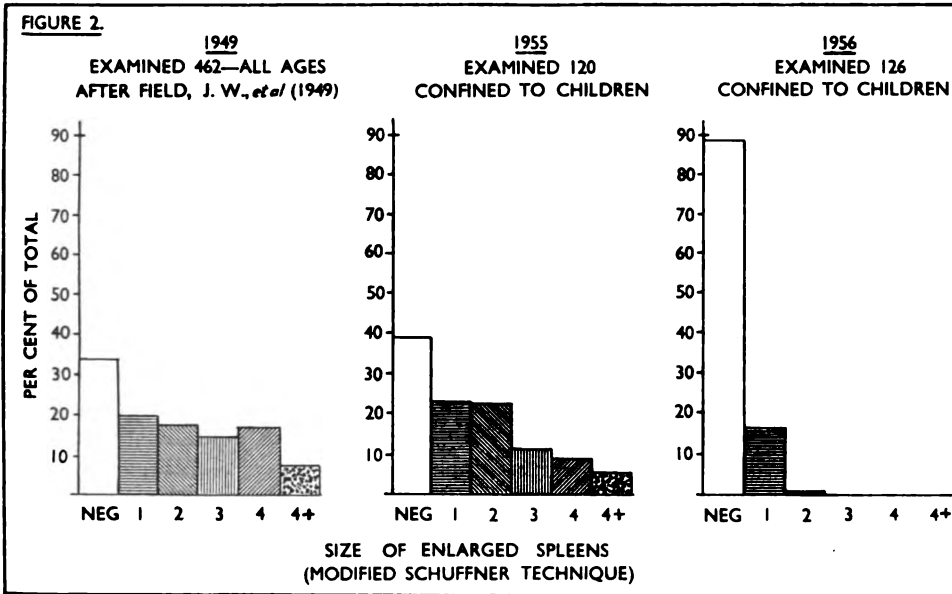
* Note: In the 3 cases with positive blood slides in the 1956 survey, parasites were very scanty indeed.

Table 4. *Kampong Tekek. Comparison of results of Spleen and Parasite Surveys in 1955 (preliminary survey) and 1956 (after control)*

Age group (years)	Numbers of children examined		Spleen rates per cent		Average enlarged spleen		Parasite rate per cent	
	1955	1956	1955	1956	1955	1956	1955	1956
5-9	44	37	61.4	27.0	1.5	1.1	56.8	Nil
10-14	29	42	48.3	9.5	1.2	1.2	48.3	2.4
15 +	4	8	25.0	Nil	1.0	Nil	25.0	Nil
TOTAL, all ages	77	87	54.6	16.1	1.4	1.1	52.0	1.1

Table 5. *Kampong Juara. Comparison of results of Spleen and Parasite Surveys in 1955 (preliminary survey) and 1956 (after control)*

Age group (years)	Numbers of children examined		Spleen rates per cent		Average enlarged spleen		Parasite rate per cent	
	1955	1956	1955	1956	1955	1956	1955	1956
5-9	18	17	83.3	35.3	1.6	1.0	66.7	Nil
10-14	14	16	57.1	6.3	1.2	1.0	71.5	12.5
15 +	4	6	50.0	16.7	1.0	1.0	50.0	Nil
TOTAL, all ages	36	39	66.7	20.5	1.4	1.0	66.7	5.1



DISCUSSION

Reductions of 70.6 per cent in the overall spleen rate, a further 22 per cent in the size of the average enlarged spleen and 95.8 per cent in the parasite rate were most satisfactory findings of a survey made at the end of what should have been the peak transmission period of the parasite. Such a result in a highly endemic area is unlikely to have been achieved by either insecticidal measures

or short-term chemoprophylaxis alone, but was probably the outcome of the combination of the methods.

Such a programme was possible because the population was readily accessible to the control team, so that drug administration could be effected without too much difficulty. In many mainland malaria control projects, however, chemoprophylaxis is a formidable undertaking and may be found to be impractical because of the difficulty of supervision. With the success of modern methods, however, many countries envisage the eradication of the disease within their territory, and the aim is to eliminate the parasite and control the vector by the quickest possible means before the problem of anopheline insecticide resistance can make its appearance. It is therefore likely that a drastic reduction in the parasite load at the beginning of a control project must greatly improve the chances of eventual eradication. The use of a drug which inhibits sporogony, such as pyrimethamine or proguanil, until the residual insecticide has begun to take effect is advocated for use either alone or, preferably, combined with a single dose treatment with a good schizonticide.

Future Programme

The Health Department of Pahang proposes to continue the control by quarterly residual spraying with B.H.C. A team of three labourers, living on Pulau Tioman, will carry out this periodic spraying and will be responsible for trimming and clearing streams and breeding places meanwhile.

SUMMARY

An experiment in the control of malaria in a highly endemic island off the east coast of Malaya is described.

The method used was a combination of short-term chemoprophylaxis, which drastically reduces the natural parasite load, with residual spraying which aims at controlling the vector before sporogony is complete.

A satisfactory level of control was attained much more rapidly by the combined measures than could be expected with either method alone.

It is hoped that subsequent surveys will be carried out annually in order to assess the progress of malaria control in Pulau Tioman.

Thanks are due to many people whose co-operation helped to make a success of this control project. These include the Royal Navy in Singapore, with special mention of Surgeon Commander C. P. Collins, R.N., who provided the facilities required for the survey and control; the medical administrative staffs of G.H.Q. FARELF and Singapore Base District, and especially Colonel R. S. Niven, M.C.; the government dispenser on Pulau Tioman, Mr. Tan, for his hospitality and invaluable assistance to the survey team; the Pahang Health Department for their co-operation and for making available the results of their survey work; W.O.I C. H. J. Chevis, who prepared the figures for the article; and finally to those members of the team whose hard work during the three arduous visits to the island has been responsible for the good results achieved—Captain Muir, Corporals Payne and Bailey, Privates Mugford and Hughes, all members of the Royal Army Medical Corps, and especially Mr. Ong Yeok Wah who acted as clerk and interpreter on all three occasions.

AN OUTBREAK OF CLOSTRIDIUM WELCHII TOXIN FOOD POISONING

BY

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THE Public Health Laboratory Service reports (1955 and 1956) show a steadily increasing annual incidence of notified food poisoning. *Clostridium welchii* caused only 1 per cent of all incidents, *i.e.* outbreaks, family outbreaks and sporadic cases, in 1956, but was responsible for 12 per cent of the total number of outbreaks, an increase of 3 per cent on the previous year's figures. One cannot say if this is a real increase or if it is due to improved notification. The specialised techniques required in laboratory diagnosis are now perhaps employed more often than in the past.

The majority of outbreaks of food poisoning due to *Cl. welchii* toxin have been caused, as might be expected, by heat-resistant strains (Hobbs *et al.*, 1953). Collee (1954, 1955) reported two outbreaks due to such strains, both of which occurred in the same barracks but at different times. Hobbs and her colleagues mentioned two outbreaks due to hæmolytic, heat-sensitive strains, in one of which braised beef probably became contaminated after cooking. This paper describes a large outbreak in a recruit unit caused by a hæmolytic, heat-sensitive strain of *Cl. welchii* in meat stew.

THE OUTBREAK

Diarrhœa of sudden onset occurred in men of two companies in the early hours of Friday, 30th November, 1956. The outbreak was mild and none of the cases was sufficiently severe to call out the medical officer until some hours later, when he saw 66 men at normal sick parade. By this time symptoms had abated and only a few cases required treatment. The only physical sign found was slight abdominal tenderness in a few cases; there was no pyrexia. Inquiries revealed that perhaps another 50 or more men had suffered minimal symptoms but did not report sick. This might have been due to a natural reluctance to forfeit the forthcoming week-end leave. These fears were justified as it was considered inadvisable to accept the risk, however slight, of disseminating infection to various parts of the United Kingdom.

It was soon evident that all cases had occurred in men of "B" and "C" Companies only, H.Q. and "A" Company being unaffected. Symptoms of all 66 men were listed; 58 had diarrhœa, 52 abdominal pain, three had vomited

or short-term chemoprophylaxis alone, but was probably the outer combination of the methods.

Such a programme was possible because the population was referred to the control team, so that drug administration could be effected with much difficulty. In many mainland malaria control projects prophylaxis is a formidable undertaking and may be forced because of the difficulty of supervision. With the success however, many countries envisage the eradication of the parasite from a territory, and the aim is to eliminate the parasite and the quickest possible means before the problem of an epidemic can make its appearance. It is therefore likely that the parasite load at the beginning of a control project will be the chances of eventual eradication. The use of drugs such as pyrimethamine or proguanil, until they take effect is advocated for use either as a single dose treatment with a good schizonticide.

Future Programme

The Health Department of Pulau Tioman, will carry out the trimming and clearing stream.

An experiment in the coast of Malaya is described.

The method used which drastically reduces aims at controlling

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It is hoped to assess the pro

Thanks to the control team to make the stew about five hours later. This would likely culture medium for *Cl. welchii*. None of the stewing tion of Sir was apart from that in the stew, but the meat supply system was for the later with negative laboratory results. Samples of the tinned peas and Sir, the stew were also bacteriologically negative. The history of the meat to the is of interest; it had come from a central supply depot by vehicle four days previously. It was butchered and issued from the central butchery the day before being cooked. In the four-day interval mentioned above it had been stored in ice at low temperature, but the system of supply involves a fair amount of handling. It was not feasible to investigate all butchers and other food handlers associated with this supply system.

BREAK OF CLOSTRIDIUM WELCHII TOXIN
FOOD POISONING

BY

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AND

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reports (1955 and 1956) show a steadily increasing incidence of food poisoning, *Clostridium welchii* being the most common organism isolated. In 1955, 12 per cent of the total number of cases were due to *C. welchii*. The organism was isolated from 12 per cent of the total number of cases. The organism was isolated from 12 per cent of the total number of cases.

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 it was almost certainly type A. The onset of symptoms
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 cookhouse. The guard dogs were in a similar compound in a
 of the camp, also separate from cookhouses and at a distance from
 ages. It is likely that the rats were attracted by the dogs' food and may
 have been the reservoir of infection. The rats were exterminated and dogs and
 hounds removed immediately. A final factor of some importance is that the
 outbreak occurred in recruits. Collee (1954) states that recruits appeared to be
 more severely affected. No permanent staff were at risk in this outbreak so a
 similar comparison is not possible. It is interesting to speculate what the effects,
 if any, would have been on older, regular soldiers.

DISCUSSION

Table 1 summarises the results of laboratory investigations. The noteworthy
 feature was the isolation of a hæmolytic, heat-sensitive *Cl. welchii* from the stew
 and from 14 persons, all with symptoms, who had eaten it. Hobbs *et al.* (1953)
 isolated heat-sensitive organisms from two outbreaks in 1951. In one of these
 it was stated that the meat may have been contaminated after cooking. In the

and only one complained of headache. These symptoms and the nature of the outbreak suggested food poisoning and attention was directed to the cookhouse shared by "B" and "C" Companies only. The total number at risk in these two companies was about 500.

Table 1 shows the number and type of specimens containing hæmolytic *Cl. welchii*.

Table 1. *Results of bacteriological investigations*

	Number investigated	Number of specimens	Number of positive specimens	Number of persons giving positive results
Patients (rectal swabs or fæces)	26	54	21	14
Meat stew	—	1	1	—
Tinned peas	—	1	0	—

EPIDEMIOLOGY

Source of infection

The suspect cookhouse was visited and the previous day's meals were noted. It was found that of the 66 cases, 56 had lunch at twelve o'clock the previous day, all 66 had tea at five o'clock and only nine had the late supper meal. Many of the cases had snacks in the canteen later, but there appeared to be no common food factor. In view of these findings the tea meal was investigated in detail and it was found that meat stew was the main course. There had been no complaint about the taste or smell of this stew. Fortunately some was available, and a sample was sent the same day (30th November) to the Public Health Laboratory. Next morning (1st December) a telephoned report was received that *Cl. welchii* had been isolated from the stew. The stew had been prepared by adding tomato purée, peas and onions to fresh stewing beef. Unfortunately none of the tomato purée remained separate from the stew. This purée had been made up by adding tinned tomato soup to bacon rind and bacon bones; it was made immediately after the breakfast meal, heated up and then allowed to cool before being used to make the stew about five hours later. This would have been a very likely culture medium for *Cl. welchii*. None of the stewing beef was available apart from that in the stew, but the meat supply system was investigated later with negative laboratory results. Samples of the tinned peas added to the stew were also bacteriologically negative. The history of the meat supply is of interest; it had come from a central supply depot by vehicle four days previously. It was butchered and issued from the central butchery the day before being cooked. In the four-day interval mentioned above it had been stored in ice at low temperature, but the system of supply involves a fair amount of handling. It was not feasible to investigate all butchers and other food handlers associated with this supply system.

The cases

Rectal swabs or fæces were obtained from 26 of the 66 cases seen by the medical officer. A heat-sensitive hæmolytic *Cl. welchii*, type A, was isolated from 14. The original strain from the stew was not typed, but as it was hæmolytic and heat-sensitive it was almost certainly type A. The onset of symptoms occurred in all cases between 4 and 6 a.m. on 30th November, which indicated an incubation period of 11 to 14 hours, and this, associated with mild diarrhœa and abdominal pain without pyrexia and an almost complete absence of vomiting, suggested the possibility of *Cl. welchii* toxin as a cause rather than staphylococcal toxin. It was estimated that not more than 100 of about 500 men at risk had symptoms, which appears to be a low attack rate, but some of those apparently at risk may have eaten non-contaminated portions of stew (McClung, 1945).

Food handlers

Two of the six cooks in the cookhouse had symptoms and it was therefore decided to take all six off duty immediately, pending bacteriological investigation. All six were subsequently shown to have hæmolytic, heat-sensitive *Cl. welchii* in their fæces. None was found to be excreting organisms of the salmonella or shigella groups. As the two affected cooks developed symptoms at the same time as the other cases and had both eaten stew at tea time the day before, it is clear that they, and probably also the four other cooks, who were symptomless excreters, derived their infection from the stew.

Other factors

A rodent problem existed in the camp at the time of the outbreak and there was some evidence of rodent infestation in the incriminated cookhouse. A further unusual feature was the presence of another animal species, a large beagle pack and two Alsatian guard dogs. The pack was housed in a wired compound in close proximity to the men's living accommodation but at some distance from their cookhouse. The guard dogs were in a similar compound in a different part of the camp, also separate from cookhouses and at a distance from the beagles. It is likely that the rats were attracted by the dogs' food and may have been the reservoir of infection. The rats were exterminated and dogs and hounds removed immediately. A final factor of some importance is that the outbreak occurred in recruits. Collee (1954) states that recruits appeared to be more severely affected. No permanent staff were at risk in this outbreak so a similar comparison is not possible. It is interesting to speculate what the effects, if any, would have been on older, regular soldiers.

DISCUSSION

Table 1 summarises the results of laboratory investigations. The noteworthy feature was the isolation of a hæmolytic, heat-sensitive *Cl. welchii* from the stew and from 14 persons, all with symptoms, who had eaten it. Hobbs *et al.* (1953) isolated heat-sensitive organisms from two outbreaks in 1951. In one of these it was stated that the meat may have been contaminated after cooking. In the

present account it is suggested that the stew was contaminated before cooking, possibly by the tomato purée added to it, and that the cooking temperature was insufficient to prevent further bacterial multiplication. It is unfortunate that none of the tomato purée was left over for sampling. Some further samples of meat were also negative, but at this stage none of the original stewing beef was available. Collee (1955) isolated *Cl. welchii* from the unit butcher. It was not possible to investigate all the butchers and food handlers associated with this supply system, nor would it appear worth while, because *Cl. welchii* is commonly present in the faeces of normal people (Topley & Wilson, 1955). Good cookhouse technique must prevent bacterial multiplication and sporulation during cooking. This was lacking in the present outbreak. The tomato purée had been prepared soon after the breakfast meal, boiled, allowed to cool and then reheated in the stew several hours later. The stew itself had been prepared several hours before the meal and had been allowed to simmer slowly before it was served. Both Hobbs *et al.* (1953) and Collee (1954) stress the importance of proper cookhouse procedure and this outbreak supports this view. To prevent food poisoning due to *Cl. welchii* the following requirements are stressed: (a) Food should only be prepared immediately before it is cooked, (b) cooking should be as rapid as possible and at high temperature, (c) food should be served promptly with the minimum of handling and (d) reheated foods, especially meat gravy or stew, should not be used. These points are well known and are stressed in the training of cooks, but, like all discipline, require constant vigilance if they are to be effective. If this can be achieved, and it is eminently practical, then screening of possible carriers of *Cl. welchii* among cooks and food handlers is unnecessary. Hobbs *et al.* (1953) state that type A strains are frequently isolated from the faeces of normal people and from a wide variety of foodstuffs. In view of this and the frequent changes in cookhouse personnel, routine laboratory investigation of such persons is considered unnecessary.

There is wide variation in the figures reported for the time taken to kill spores of *Cl. welchii*. Headlee (1931) states that spores do not survive boiling at 100° C. longer than five minutes, whereas Zeissler & Rassfeld-Sternberg (1949) found that spores survived boiling for one to four hours.

With regard to the possible animal reservoir of infection, Hobbs *et al.* (1953) isolated *Cl. welchii* from mice, rats, dogs, pigs, cattle and flies. This emphasises the necessity of eliminating rodents and of removing dogs or other domestic animals from unit lines.

The suggestion that recruits may be more severely affected than others must be seriously considered. This applies in many infectious diseases and may be true of response to this enterotoxin also. Recruits come from a relatively sheltered family environment at the age of 18 years and are exposed in large numbers to a variety of organisms of which they may have had no previous experience. Training units such as the one considered here change over their recruits every six weeks, thus maintaining a constant influx of susceptible personnel. Strict application of food hygiene and proper cooking procedure is therefore of great importance.

SUMMARY

A large but mild outbreak of toxic food poisoning due to heat-sensitive *Cl. welchii* (type A) is described, in which the symptoms were predominantly abdominal pain and diarrhoea.

Sixty-six out of 500 men at risk were affected, but many more milder cases did not report sick.

Six cooks were found to be excretors, but it was thought that they became infected through eating stew.

It is considered that as a heat-sensitive organism was isolated the method of cooking was at fault. The importance of improved cooking procedure rather than exclusion of carriers is emphasised.

The reservoir of infection might have been rodents and dogs in this outbreak.

We are indebted to Dr. G. Tee of the Public Health Laboratory Service, who carried out the bacteriological investigations, and would like to thank him also for his advice and assistance in preparing this paper.

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RESPIRATORY SIGNS AND SYMPTOMS IN YOUNG SOLDIERS AND THEIR RELATIONSHIP TO SMOKING

BY

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ONE of the commonest chest diseases in this country is chronic bronchitis. It is frequently responsible for the downgrading and also the invaliding of otherwise useful soldiers. Despite this, the ætiology is only partly known. Most studies are done on middle-aged subjects in whom the disease is fully developed but who often give a ten- or twenty-year history. It should therefore be profitable to study the young in whom the disease might be starting and who may therefore be in closer contact with the original causes. In this article an attempt is made to investigate the influence of smoking in the development of what may be the early stages of chronic bronchitis.

METHOD

The following series consists entirely of men who were due for their release medical examination. They were all aged between 20 and 30 years, the majority between 20 and 22, having been in the Army two to three years. They were all members of the 16th Independent Parachute Brigade and all had a physical efficiency standard "Forward Everywhere." To enter the Brigade, in addition to being medically fit, they have to pass very strenuous physical tests, and after this are still regularly exposed to severe exertion. This might be expected to reveal any medical disability which was not discovered at the original entry examination. Anyone who broke down, or whose exercise tolerance did not remain rather above average, was posted from the Brigade and did not have his release medical examination here. It is therefore reasonable to suppose that none of the men seen had any chronic condition which might originally have developed in childhood, such as a cardiac abnormality, asthma, or the late results of acute chest infection, and which affected them now in any way.

Almost everyone had spent the last two years either in the reasonably clean air of Aldershot or the very clean air of Cyprus. For at least two years they had not been exposed to any noxious fumes nor to poor working conditions. Their living conditions had been adequate and their nutrition good.

When the men were seen for their release medical examination, a routine history was taken and clinical examination carried out. The smoking history was taken as the very last part of the examination to avoid bias, though unfortunately the discovery of nicotine-stained fingers or a smoky breath sometimes hindered this.

About a third of these men had had a miniature mass radiograph in the previous six months and all had had one within the previous three years. No abnormality had been found in anyone.

RESULTS

One hundred and forty-seven men were seen between May and November, 1957. The incidence of smoking habits and their relation to clinical abnormalities in the respiratory system are shown in Table 1.

Table 1. *Relationship of smoking to symptoms and signs in the chest*

Symptoms of chest disease	Signs of chest disease	Number of cigarette smokers	Number of pipe smokers	Number given up smoking	Number of non-smokers
None	None	57 (69%)	5 (100%)	7 (100%)	51 (98%)
None	Rhonchi	15 (18%)	0	0	1 (2%)
Cough	None	2 (2%)	0	0	0
Cough	Rhonchi	3 (4%)	0	0	0
Cough and sputum	None	4 (5%)	0	0	0
Cough and sputum	Rhonchi	2 (2%)	0	0	0
Totals	...	83	5	7	52

The abnormal chest signs noted were sonorous or sibilant rhonchi. In some cases these were localised in one area and often shifted or disappeared on coughing; in others these were generalised, but even then often completely symptomless. No râles were heard.

Cough and sputum were, if present, always slight. It was also found that the interrupted, jerky type of respiration, known as "cog-wheel," was far more frequent among smokers than among non-smokers. As this is partly a subjective finding and a borderline between it and normal vesicular breathing is difficult to draw, no figures were obtained. It was, however, often possible to predict fairly confidently after auscultation that a man was a smoker because of this, even when no definite rhonchi were heard. This was particularly so in men over twenty-five.

Two men had previously reported sick with chest symptoms lasting more than a week. They had both complained of cough and sputum. In each, previous examination had shown diffuse rhonchi and a mucoid sputum, otherwise no abnormality. Chest radiographs had been normal. Both still had signs and were listed accordingly.

Table 2 shows the relation of the presence of some abnormal sign or symptom referable to the respiratory system to the number of cigarettes smoked. Most men started smoking at about 16 to 18 and have therefore smoked for from four to six years. The figures suggest that on the whole the incidence of abnormal signs and symptoms increases with increased cigarette consumption.

There was no significant correlation between any specific previous occupation and the presence of abnormal chest signs, if allowance is made for the variations in the proportion of smokers among the different occupations (Table 3).

Table 2. *Relationship of the number of cigarettes smoked to the number of men with respiratory abnormalities*

Number of cigarettes smoked	Total number of men	Number of men with respiratory abnormality
Less than 1 per day	59	1
5 or less per day	8	1
10 or less per day	34	10
20 or less per day	38	15
More than 20 per day	3	0
Pipe smokers	5	0
Totals	147	27

Table 3. *The relationship of previous occupation to the presence of respiratory abnormality*

Occupation	Number of smokers, including pipe	Number of non-smokers	Number of men with respiratory abnormalities
Miner	12	2	4
Army	13	6	6
Outdoor worker	23	15	5
Indoor worker	22	21	8
Merchant Navy	7	2	2
Student	4	7	1
Clerical	7	6	1
Totals	88	59	27

Only a crude classification was possible owing to the small number in the series. "Army" includes those who have been in the Army for more than four years. "Indoor" workers include factory workers and engineers.

It might be of more interest to know the occupation of the father and some detail of the early home background. However, as discussed above, in this selected series this is unlikely to be important.

Eight men gave a history of previous attacks of recurrent acute bronchitis or pneumonia. Only one of these had abnormal chest signs. None admitted to having asthma. All had excellent exercise tolerance.

The men came from all parts of the country and no bias could be detected for any one area. The one non-smoker listed with chest signs (Table 1) was aged 21, an ex-engineer from Birmingham. He had no past history of chest disease and no complaints. Examination showed some sonorous, inspiratory, rhonchi in all fields.

DISCUSSION

The most surprising finding was the frequency with which occasional rhonchi were found in otherwise completely fit men. It is generally assumed that these always indicate some bronchial abnormality, either excess mucus, œdema of the wall, or bronchial spasm.

The symptoms of cough and sputum need not necessarily originate in the chest ; they might be due to chronic pharyngitis or post-nasal discharge. However, in each of the listed cases the history suggested a chest origin for the symptoms.

On the whole the above figures suggest that quite a proportion of otherwise very fit young men, 18 per cent in this series, have some degree of respiratory abnormality. In a group where other possible causes are largely excluded this is almost entirely confined to smokers. Even after a comparatively short exposure, they seem to develop some sort of reaction in their bronchi to smoking.

In the above cases this reaction was usually mild and did not affect their general health. However, the following case-history is typical of a condition frequently seen.

Corporal M., who has been in the Army for six years, complains that recently he became breathless more easily than he used to and that he cannot keep up with his section when running uphill. He has had a slight morning cough, sometimes productive, for about a year. He has had no previous chest trouble such as asthma or acute bronchitis, no loss of weight, night-sweats nor hæmoptyses. He smokes 15 to 20 cigarettes a day and has done for eight years. On examination he looks fit, temperature is normal, and there is no dyspnœa or cyanosis. Diffuse inspiratory and expiratory rhonchi are heard in all lung fields. Sputum is mucoid. Chest radiograph is normal.

He is advised to stop smoking, which he does, and after two months his exercise tolerance is normal and examination of his chest shows no abnormal signs.

These men usually complain of a chronic cough or a loss of exercise tolerance, though the latter would still be considered normal in a chest clinic. They are always heavy smokers and examination of the chest often, but not always, reveals the presence of rhonchi. The chest radiograph is normal. They recover if they stop smoking. However, they often do not manage this. But just cutting smoking down seems to make no difference at all to their condition. Can this condition be called chronic bronchitis ?

To make a diagnosis of chronic bronchitis the symptoms of cough and sputum must have been present for some years. There should be evidence of chronic bronchial infection with acute exacerbations and some loss of exercise tolerance. The disease is stationary or progressive but not permanently curable. The various signs and symptoms described above cannot really be covered by this label.

Waldboth (1953) described a "smokers' syndrome" in which the main symptoms are wheezing, dyspnœa, cough and loss of exercise tolerance with chronic pharyngitis. His mild cases resemble those seen here and they completely recovered after stopping smoking. However, the more severe cases did not, but the symptoms of these fitted in with usual description of chronic bronchitis. Waldboth thinks that these are just two grades of the same thing, a reaction to smoke.

Lister (1955) marshals strong evidence that the primary lesion in bronchitis is a basically allergic reaction of bronchial tissue and that the infective element is

secondary and occurs later. This concept is supported by the pathological evidence presented by Reid (1954). She has shown that in early chronic bronchitis, histological section of bronchioles shows excess goblet cells and mucus glands and an overproduction of mucus. It is only later that purulent bronchiolitis and abscess formation occur.

Oswald (1954) stresses the importance of the interaction of mucus production and infection in the pathogenesis of bronchitis and suggests how the excess of mucus may lower the resistance of the bronchi to viruses and bacteria.

It is reasonable to postulate that the pathogenesis in our cases is also some bronchial spasm and an overproduction of mucus. This may by now be allergic, or a direct foreign body reaction, the foreign body being some part of tobacco smoke. The stage is set for the development of true chronic bronchitis, but this has not yet occurred and may never do so.

However, tobacco cannot be unique in irritating the bronchi in this way. For example, Oswald & Medvei (1955) questioned civil servants in London about respiratory symptoms; 1,191 males were between 15 and 39 years of age. Of the 680 smokers, 276 (40.6 per cent) had no symptoms, 340 (50 per cent) had mild symptoms and 64 (9.4 per cent) had bronchitis. Out of 511 non-smokers 255 (49.9 per cent) had no symptoms, 235 (46 per cent) had mild symptoms and 21 (4.1 per cent) had bronchitis. While there is a difference it is not striking. Palmer (1954) also reports a series in which bronchitis is more frequent among smokers but by no means absent among non-smokers, and Fry (1954) could find no relation in a smaller series between the incidence of bronchitis and smoking habits.

Oswald, Harold, & Martin (1953) have shown that heredity, childhood infection, poverty, allergy, weather, air pollution and smoking all may play a part in the ætiology of bronchitis. It is, however, very difficult to separate the effects of each of these factors and so show what part they play individually, and how they might combine to act on lung tissue.

In the Army some of these factors are absent and others affect everyone equally. It should therefore be possible to obtain adequate series for the investigation of some aspects of bronchitis in the Army, in which possible ætiological factors are better known and controlled than in other walks of life.

In our series smoking was almost the only one of these factors present for the last two years, and this may explain the unequivocal results obtained in this small investigation. However, these have little other value unless they can be repeated on a much larger scale.

SUMMARY

One hundred and forty-seven men, aged between 20 and 30 years, were examined at their release medical examination for chest signs and symptoms.

Thirty-one per cent of cigarette smokers and 2 per cent of non-smokers had some mild signs. The men had not been exposed to any other form of lung irritation for at least two years.

Some evidence is given that smoking can produce more severe symptoms. The relation between smoking and chronic bronchitis is discussed.

I would like to thank Major J. L. Kilgour, M.B., Ch.B., R.A.M.C., for his encouragement.

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TRAUMATIC EFFUSION OF THE KNEE—A DISCUSSION

BY

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PATIENTS suffering from chronic lesions of the knee following injury are all too familiar to any surgeon attending orthopædic out-patients. A considerable proportion have identifiable lesions amenable to specific treatment, *e.g.* tears of the cartilages. In many, however, no such lesions can be found and the only physical signs are wasted quadriceps muscles and effusion. This effusion, the patient will tell you, varies in size and any minor strain or undue exertion suffices to cause an exacerbation. In addition the patient may well complain that the knee "feels weak."

Why should these effusions recur so disappointingly?

What is the rationale of treatment?

The function of the knee joint

The instability of the bony configuration of the knee is universally recognised. The elbow joint has a similar range of movement, but because of the socket shape of the trochlear notch considerable skeletal stability is achieved. The fundamental difference between the two joints perhaps depends upon the factor of weight bearing. This requires that the inferior aspect of the femoral condyles be relatively extensive, and the curvature of the condyles cannot therefore be constant—a true hinge joint being thereby impossible. Some stability is provided by the ligaments, but these are only taut in limiting positions. It appears then that the quadriceps muscle with its tendon and expansions must be the mainstay of the stability of the joint. Indeed the quadriceps expansion comes so far back (to the level of the collateral ligaments) that the muscle grips

about two-thirds of the circumference of the joint. With the patella and top of the tibia these expansions effectively complete a socket for the condyles, while the situation of the patella in a groove on the femoral surface enhances the control effected by the quadriceps muscle.

It may be suggested then that in addition to its function as a prime mover of the knee, the quadriceps shows in extreme degree that function as a "living-ligament" with which we are familiar in the short muscles of the hip and shoulder. Such function must depend on the very rapid and powerful reflex activity of the muscles, and accords with the high speed and plasticity of the stretch reflex.

The reaction of the quadriceps to injury

It is a matter of simple observation that extremely rapid wasting of the quadriceps follows acute inhibition after injury. It is not altogether easy to understand a reaction which proves so disastrous in the long run—but it is probably an effect of the intensive inhibition of local muscle tone induced by nociceptive stimuli. With the muscle in such a state it is not surprising that innumerable minor strains prove injurious, with recurrence of effusion.

It seems likely, too, that the displacement of the quadriceps expansion by a large effusion should impair the mechanical perfection of the "socket," and should distort the reflex settings upon which integrity of quadriceps function depends.

The vicious circle of "traumatic synovitis"

The foregoing discussion arises from an attempt to explain the association of chronic quadriceps wasting with recurrent effusion, so familiar in the out-patients department. It is postulated that the muscle wasting and the effusion comprise a vicious circle, and that rational therapy is designed to break it. We have two points of attack :

- (a) The quadriceps.
- (b) The effusion.

Management of the quadriceps

The value of quadriceps exercise has been widely recognised. Yet it is disheartening to notice the number of cases of traumatic synovitis seen in out-patients for the first time, months after initial injury, in whom no such exercise has been advised or practised and in whom the muscle is grossly flabby and wasted.

It may be stated dogmatically that in any knee injury with effusion not severe enough to warrant immediate hospitalisation vigorous supervised quadriceps drill should be started at once—straight leg raising being almost entirely adequate and entirely safe. Most soldiers, I suspect, will drill the muscle sufficiently only under strict hospital supervision.

Almost universally the effusion disappears permanently when the quadriceps has regained adequate power and bulk. Further recurrence compels a careful search for some unrecognised specific lesion.

Management of the effusion

We have the following measures at our disposal :

- (1) Rest.
- (2) Aspiration.
- (3) Control by pressure.
- (4) Natural reabsorption of the effusion as healing proceeds.

Rest.—The essence of this is release from weight bearing, and suggests that initial treatment of all large knee effusions, in Army personnel, should be undertaken on an in-patient basis, with confinement to bed. When, because of the apparently slight nature of the injury, ambulant treatment is prescribed careful supervision is surely essential, any delay in recovery suggesting the need for bed rest.

Aspiration.—It is generally agreed that hæmorrhagic effusion should be aspirated because intra-articular blood is irritant and may lead to adhesions. If it is agreed, however, that the mere bulk of an effusion impairs quadriceps control, and hence recovery, it may be thought that a controlled trial of aspiration as a first step in the management of large simple effusions would be worth while.

Pressure.—The Robert Jones bandage ingeniously provides compression and a high degree of immobilisation, if well applied. Probably because of their rapid loss of elasticity, and relatively small support, crêpe bandages should be regarded as essentially a placebo, to be used in conjunction with other treatment.

Natural reabsorption.—Le Gros Clark (1945) points out that synovial absorption of the joint fluid increases with movement of the joint. On the other hand, it seems reasonable to suppose that movement of a joint in the acute stage of injury will tend to exacerbate the pathology.

While at the Military Hospital, Wheatley, I was for a few months much concerned with the chronic knee effusions in the hospital. During that period the physiotherapists and I changed our policy from limiting quadriceps drill to straight leg raising until the effusion was almost resolved, and introduced active non-resisted knee flexion exercises immediately the acute reaction appeared to be past. I have not had an opportunity to make anything of the nature of a controlled trial, but our observations at that time lead me to think that such a controlled trial would be well worth while.

SUMMARY AND CONCLUSIONS

It is suggested that the ætiology of "traumatic synovitis" of the knee is a vicious circle of quadriceps wasting and joint effusion, and that this depends upon the peculiar function of the quadriceps as a living ligament to the knee, its sole stabiliser in many positions.

The value of quadriceps exercises, and the lack of appropriate enthusiasm for them, is emphasised. In the management of the effusion itself, the use of aspiration, the place of non-resisted flexion exercises, and the use of the pressure bandage are discussed.

It remains to ask what is the eventual outcome in cases where these effusions and their concomitant wasted quadriceps persist indefinitely. I do not know of any certain answer to this question, but wonder in what proportion of cases of idiopathic osteo-arthritis of the knee in older people a history of such earlier effusions would be obtained by direct questioning. I have seen at least two cases in men of about 30 in whom an early osteo-arthritis has arisen after a few years of such recurring effusions associated with weak quadriceps.

My thanks are due to Lieut.-Colonel J. M. Matheson, O.B.E., M.R.C.P.(E.), F.R.C.S.(E.), R.A.M.C., and to Lieut.-Colonel I. M. Grant, F.R.C.S., R.A.M.C., for their encouragement and advice in the preparation of this paper.

REFERENCE

LE GROS CLARK, W. E. (1945). *Tissues of the Body*, 2nd ed. London : Cumberlege. P. 155.

A CASE OF SURGICAL EMPHYSEMA FOLLOWING DENTAL EXTRACTION

BY

Major G. H. CARRIETT

Royal Army Medical Corps

SURGICAL emphysema following dental operations appears to be a rare occurrence: 46 cases have been reported since 1900. A further case is now reported which by a coincidence occurred within a few days of publication of an article on the condition by Shovelton (1957).

A healthy soldier, aged 22 years, had an extraction of his lower right second molar under regional anæsthesia on 18th February, 1957. Following the extraction he used antiseptic mouthwashes and the socket was syringed daily. On 21st February, 1957, he reported that for the past three days he had noticed a cracking sensation on the right side of the face.

On examination a mild degree of surgical emphysema was detected in the right temporal region, over the right cheek and especially below and anterior to the angle of the right mandible. The socket appeared healthy and there was no evidence of sinus or antrum pathology.

The condition had subsided without treatment by 23rd February, 1957.

REFERENCE

SHOVELTON, D. S. (1957). *Brit. dent. j.*, **102**, 125.

THE FIRST FIELD DRESSING

BY

Major-General R. E. BARNESLEY, C.B., M.C., M.B.

THE dressing of the wounded in battle must go back almost as far as history itself, and it is difficult to believe that in such a well-organised force as the Roman Army it did not occur to the powers-that-be to make a general issue of some handy form of first-aid dressing which the soldier could apply to himself or his comrades. So far, however, we have not been able to find a record of anything in the nature of such a dressing until the Crimean War.

In the Royal Army Medical Corps Historical Museum at Crookham there is in a small glass case a package bearing a faded, almost illegible label which reads as follows :

FIRST FIELD DRESSING

First ordered to be carried by every soldier on taking the field
as part of his field kit during the Crimean War.

The list of contents reads :

“Bge 12 Yds & 12" × 2" & pins”

It has not been possible to trace the origin of this specimen, though it is almost certain that it originated at our first medical college founded at Fort Pitt, Chatham, in 1860 and afterwards moved with the college via Netley to Millbank. It was the hospital at Fort Pitt that received the Crimean casualties.

This dressing is referred to by Sir Thomas Longmore in his book, *Gunshot Injuries*. He mentions that an Army Medical Department Circular of May, 1855, informed officers that the Secretary of State for War had decided that a first field dressing should be a component part of every British soldier's kit. It was to consist of a calico bandage, 4 yards by 3 inches, and fine lint, 12 inches by 3 inches, folded flat and fastened by pins. The pins incidentally are the ordinary steel pin, so presumably this was in the days before the safety-pin was invented.

The dressing was originally carried in the knapsack, but, in describing a later dressing of 1873-4, Longmore emphasises that it should be “carried in a breast pocket of suitable size on the left side of the tunic as soldiers during fighting, will disencumber themselves of their valise equipment.”

Colonel W. H. C. Gillow, after searching through his records at the museum of the Royal Army Ordnance Corps, cannot agree that this was an official W.D. issue and considers that it may have been “allowed” and was distributed by an interested party. Can it not have been that the dressing was distributed by hospitals through medical channels and not as an article of military equipment or clothing?

Next we come to a second package, also in the R.A.M.C. Museum, which bears the following label :

FIRST FIELD DRESSING PACKET NO. 2

Designed by Sir Thomas Longmore, Surgeon General R.P.
Contents of No. 2

1. Two pads of Carbolised Tow. Dimensions 4"×3"×1/8".
2. One carbolised gauze bandage, 2 yards long, 4" broad with 1 safety pin.
3. One triangular bandage of unbleached calico, base 48", each side 34".
4. Tinfoil 7½"×10".
5. Cover of parchment paper, secured by flour paste impregnated with perchloride of mercury (½ per cent).

At the bottom of the package is written "Egypt 1884."

The Manual of the Medical Staff Corps (1885) describes the dressing in full, adding that it is to be carried in the soldier's breast pocket on service, that it weighs 4 ounces and measures 4.5 inches by 3.25 inches by 0.87 inches.

That this is the first dressing to be issued officially through non-medical channels as part of the soldier's active service equipment is made clear in *List of Changes in War Material* 4584, 1st December, 1884.

The wording follows the traditional style :

"4584 Dressings Field

Antiseptic first field dressings have been approved for issue
on active service"

and it goes on to describe the dressing in detail.

It looks therefore as though the specimen in the R.A.M.C. Museum is the prototype of the original first field dressing to be issued as an article of clothing and equipment.

So far so good, but now other considerations come to light which seem to confuse the issue. For example, the Priced Vocabulary of Stores issued from the Military Store Depot at the Tower of London (1866) shows : "Dressings, Field, Soldier's 3d." At the other end of the scale the Director of the Inspectorate of Stores and Clothing at the Ministry of Supply has kindly supplied a full descriptive list of dressings issued, the record of which only goes back as far as 1891. This reads "Pattern received from Woolwich 3-6-1889, French Pattern sealed as British but slightly reduced in width."

In spite of all this it really seems that the first official dressing issued through non-medical channels was that described in the "List of Changes" 4584 of 1884. This is borne out by the fact that Forbes on page 101 in the second volume of his *History of the Army Ordnance Services* says that it was one of the two new accessories brought out by the 1884-5 Nile Expedition. This ties up with the note "Egypt 1884" written on Longmore's museum specimen.

It may well be that Sir Thomas was himself the originator of the Crimean dressing, for we know that he was in the trenches at Sebastopol, and there is in

the museum an old Russian note-book which he found in a captured trench and utilised for making careful notes of the wounded under his care. He was one of the most distinguished figures in military medicine and was the first professor of military surgery at the newly formed Army Medical School in 1860. He wrote extensively on the transport of wounded and medical military administration, was largely instrumental in starting St. John's Ambulance classes in 1874 and represented the United Kingdom at the Geneva Conventions of 1864 and 1884.

It may be added as a footnote that the original antiseptic dressing (carbolicised tow) was replaced by a gauze pad of 2 per cent by weight of double cyanide of mercury and zinc tinted with rosaniline before the Great War. "Euflavine" was substituted in 1929. A short-lived innovation was the addition of an ampoule of iodine in 1917.

In the early months of 1958 the late Mr. J. R. Elliott, chief pharmacist at St. Bartholomew's Hospital and an acknowledged authority on the history and origins of surgical dressings and apparatus, turned his attention to the army first field dressing. We are indebted to him for permission to use much of the material he had collected in compiling this note, which will have served a useful purpose if it elicits any addition to our meagre store of knowledge on this subject. Our thanks are also due to Lieut.-Colonel W. H. J. Gillow, of the Royal Army Ordnance Corps Museum at Blackdown, for many hours spent in searching records and regulations, and to the Director of the Inspectorate of Stores and Clothing, Ministry of Supply, for much useful information.

THE TREATMENT OF NON-GONOCOCCAL URETHRITIS WITH SPIRAMYCIN (ROVAMYCIN)

BY

Lieut.-Colonel B. LEVY, M.B.

Royal Army Medical Corps

THE isolation of spiramycin, an antibiotic prepared from *Streptomyces ambofaciens*, was reported in France in 1954. Administered orally, spiramycin has been found clinically effective in infections caused by *Staphylococcus aureus* (including strains resistant to penicillin, streptomycin, the tetracyclines and chloramphenicol) *beta*-hæmolytic streptococci, *Streptococcus viridans*, *Str. faecalis* and *Str. pneumoniae*.

Although effective in infections due to *Neisseria gonorrhæe* and active *in vitro* against *N. meningitidis*, it has little or no activity against other Gram-negative organisms and consequently does not upset the normal intestinal flora. The drug has also been reported to be successful in some infections due to rickettsiæ and viruses and good results have been obtained in the treatment of non-gonococcal

FIRST FIELD DRESSING PACKET NO. 2

Designed by Sir Thomas Longmore, Surgeon General
Contents of No. 2

1. Two pads of Carbolised Tow. Dimension
2. One carbolised gauze bandage, 2 yards
1 safety pin.
3. One triangular bandage of unbleached
each side 34".
4. Tinfoil $7\frac{1}{2} \times 10$ ".
5. Cover of parchment paper,
treated with perchloride of mercury.

At the bottom of the package is
The Manual of the Medical
full, adding that it is to be carried
it weighs 4 ounces and measures

That this is the first of
channels as part of the
List of Changes in War

The wording follows

"4584 Dressing
Antiseptic
on active"

and it goes on

It looks like
prototype
and equipment

So far

and no previous treatment. Six patients had
gonorrhœa with penicillin and had been left with a
confused. Patients had been treated with 4 g. of aureomycin. One patient
the treated with penicillin, aureomycin and streptomycin. Five patients
Fifty received 7 g. of streptomycin together with 25 g. of sulphadiazine. Seven
patients without previous treatment failed to respond to spiramycin. One
patient previously treated with aureomycin also failed.

Severity of symptoms

The degree of pyuria was unimportant in the response to treatment.

Incubation period

The average incubation period for the series was 21 days. The stated incubation periods in seven patients failing to respond to treatment were 12, 14, 15, 30, 30, 40 and 50 days (average 27 days).

B. Levy

57

and reaction to spiramycin

verse reaction to the drug in the dosage given was very mild and was on direct questioning. Eight patients stated they had looseness in no case was it necessary to discontinue treatment.

CONCLUSION

forty-eight cases of non-gonococcal urethritis, spiramycin g. was found to be 80 per cent effective. This compares chemotherapeutic agents. No serious drug reactions were

. May & Baker (Singapore) for the generous supplies

REFERENCE

r. Dis., 33, 17.

ndence

R.C.P.(E)., Royal Army Medical Corps

TUBERCULOSIS

Chest Centre (1952-1955) and having June, 1958, I was most interested to read the of tuberculosis in the Army by Large *et al.*, published October.*

ers in the Federation Army, Malaya, were placed in category P.2. months and 30 months respectively after partial lung resection for pulmonary tuberculosis in the Army Chest Centre on 30th November, 1954, and 25th January, 1955, respectively. These two cases would appear to have been overlooked by these authors : but understandably so as they were doubtless referring to the British Army and not to Commonwealth Forces (Malaya became an independent self-governing sovereign state on 31st August, 1957). Both were found to have pulmonary tuberculosis whilst officer-cadets at Eaton Hall and the R.M.A. Sandhurst. One had a right apical segmental resection after 173 days' chemotherapy and the other a right apical and posterior segmental resection after 134 days' chemotherapy.

Both were commissioned in the Federation Army on return to Malaya in late 1955 after having had an excellent convalescence at Osborne House. They were placed in category P.7 for one year and P.3 (not P.6 for obvious reasons) for one year before being placed in category P.2 in late 1957. An extract from a letter from one of these officers dated 1st September, 1958, is as follows :

* J. roy. Army med. Cps., 104, 216.

urethritis. In a series of 87 previously untreated cases of non-gonococcal urethritis Willcox (1957) obtained a 20 per cent failure rate in 77 cases followed up. The dosage used in his series was 10 to 20 g.

In the following series of forty-eight patients treated at the British Military Hospital, Singapore, in 1957 the dosage used was either 5 g. in five days or 7 g. in seven days. In all cases one tablet (250 mg.) was given six-hourly.

RESULTS

The treatment was considered successful in thirty-eight cases. Of these thirty were followed for twelve weeks while the remainder were followed for shorter periods as follows, remaining satisfactory: two were followed for eight weeks, two for six, two for four and two for two weeks respectively.

In ten cases the treatment failed. Of these, seven patients relapsed between the second and fourth week; one relapsed at the eighth week; one was not seen again and one was retreated after re-exposure to infection.

Omitting the patient re-exposed to infection, the percentage failure rate agrees with that found by Willcox and was approximately 19 per cent.

DISCUSSION

Effect of dosage

There were five failures and eighteen successes in the group of patients treated with 5 g. and four failures and twenty successes in the group treated with 7 g. The difference is not significant and, as is found in the treatment of non-gonococcal urethritis with aureomycin, increased dosage does not increase the cure rate—an important consideration in view of the cost of the drug.

Effects of previous treatment

Thirty-three patients had had no previous treatment. Six patients had recently been treated for gonorrhœa with penicillin and had been left with a urethritis. Three patients had been treated with 4 g. of aureomycin. One patient had been treated with penicillin, aureomycin and streptomycin. Five patients had received 7 g. of streptomycin together with 25 g. of sulphadiazine. Seven patients without previous treatment failed to respond to spiramycin. One patient previously treated with aureomycin also failed.

Severity of symptoms

The degree of pyuria was unimportant in the response to treatment.

Incubation period

The average incubation period for the series was 21 days. The stated incubation periods in seven patients failing to respond to treatment were 12, 14, 15, 30, 30, 40 and 50 days (average 27 days).

Toxicity and reaction to spiramycin

Any adverse reaction to the drug in the dosage given was very mild and was only elicited on direct questioning. Eight patients stated they had looseness of the bowels. In no case was it necessary to discontinue treatment.

CONCLUSION

In a small series of forty-eight cases of non-gonococcal urethritis, spiramycin in a dosage of 5 to 7 g. was found to be 80 per cent effective. This compares favourably with other chemotherapeutic agents. No serious drug reactions were observed.

Thanks are due to Messrs. May & Baker (Singapore) for the generous supplies of spiramycin.

REFERENCE

WILLCOX, R. R. (1957). *Brit. J. vener. Dis.*, 33, 17.

Correspondence

From: LIEUT.-COLONEL J. MACKAY-DICK, O.B.E., F.R.C.P.(E.), Royal Army Medical Corps

SIR, LUNG RESECTION FOR TUBERCULOSIS

As a former denizen of the Army Chest Centre (1952-1955) and having returned to the fold w.e.f. 9th June, 1958, I was most interested to read the article on lung resection for tuberculosis in the Army by Large *et al.*, published in this Journal last October.*

Two officers in the Federation Army, Malaya, were placed in category P.2. 32 months and 30 months respectively after partial lung resection for pulmonary tuberculosis in the Army Chest Centre on 30th November, 1954, and 25th January, 1955, respectively. These two cases would appear to have been overlooked by these authors: but understandably so as they were doubtless referring to the British Army and not to Commonwealth Forces (Malaya became an independent self-governing sovereign state on 31st August, 1957). Both were found to have pulmonary tuberculosis whilst officer-cadets at Eaton Hall and the R.M.A. Sandhurst. One had a right apical segmental resection after 173 days' chemotherapy and the other a right apical and posterior segmental resection after 134 days' chemotherapy.

Both were commissioned in the Federation Army on return to Malaya in late 1955 after having had an excellent convalescence at Osborne House. They were placed in category P.7 for one year and P.3 (not P.6 for obvious reasons) for one year before being placed in category P.2 in late 1957. An extract from a letter from one of these officers dated 1st September, 1958, is as follows:

* *J. roy. Army med. Cps.*, 104, 216.

"Since January, 1958, I was detached from Pay Office and attached to 1st Bn. Federation Regiment to 'jungle bash.' Though tough in a way, climbing hills and moving through swamps waist deep all the time in a half-bent position, my constitution was able to endure the strain and fatigue of the jungle operations. So far I have only noticed that on a really long stretch of more than a fortnight I do feel a little tired. Other officers feel just the same. Besides the ops I play tennis whenever I am free."

In addition a corporal-of-horse in the Royal Horse Guards who had a partial lung resection in the Army Chest Centre for pulmonary tuberculosis in February, 1955, was placed as a special case in category P.2 in June, 1958, and is at present serving with his regiment in Aden.

Naturally, as regards categorisation, all cases of partial lung resection for pulmonary tuberculosis are judged on their individual merits. There is an inclination to the view that certain specially selected cases may be suitable for upgrading to category P.2 some 36 months or so after uncomplicated resection where all radiological and palpable disease has been completely excised either by a wedge resection or by not more than the excision of two segments. Reference is made particularly to the asymptomatic bacteriologically negative case with normal E.S.R. diagnosed fortuitously on routine radiography of the chest. In some such asymptomatic cases partial lung resection may have been performed in order to establish the diagnosis of pulmonary tuberculosis beyond all doubt. In the present state of our knowledge some believe that all such cases should have a minimum of 12 months' post-operative chemotherapy and a total of 24 months' chemotherapy in all. It may be that the views declared herein may be considered overcautious as they apply to the time for upgrading to category P.2 in some certain specially selected cases, and I would not be surprised if a bolder approach is adopted in the next two to five years.

I am, etc.

CONNAUGHT HOSPITAL,
(ARMY CHEST CENTRE),
HINDHEAD,
SURREY

JOHN MACKAY-DICK.

From : LIEUT.-COLONEL W. G. MACFIE, M.R.C.P.(E.), Royal Army Medical Corps.

VIRAL ENCEPHALITIS

SIR,

I was most interested to read in your issue of January, 1959, the article entitled "A Preliminary Report on Encephalitic Type of Illnesses in Singapore" by Major M. A. C. Dowling and Captain H. E. Webb.

As officer in charge of the medical division of the British Military Hospital, Singapore, from August 1953, to July 1956, most, if not all, of the military cases in their series were under my care and responsibility, and I consequently feel entitled in making a few comments on the clinical aspect.

The idea that these cases might be a variant of scrub typhus and respond to chloromycetin therapy had no clinical justification whatsoever and would have

indicated poor judgement on the part of those responsible for their treatment. I was glad to see that the authors have abandoned this theory.

I see no mention in their article of the need to differentiate these cases from cerebral malaria, which is a curable disease. Heat-stroke also has to be considered in the differential diagnosis.

It is important for a clinician, who frequently cannot make a definite diagnosis in viral encephalitic illnesses, to exclude more treatable diseases. In this respect I quote from a review in a recent British Medical Journal by Dr. Ritchie Russell, honorary consulting neurologist to the Army, on a book entitled *Viral Encephalitis. A Symposium*:

"In cases of acute brain infection the clinician's first responsibility is to investigate very urgently the possibility of some infection of a non-viral type. Thus many of the bacterial or parasitic infections can be properly cured by modern therapy only if the diagnosis is made early."

The definitive or etiological diagnosis of the viral encephalitides must rest with our colleagues in the laboratory. If they find it difficult or even impossible, to make the diagnosis after death, how much more difficult it is for the clinician who must make the diagnosis during life.

I am, etc.

BRITISH MILITARY HOSPITAL,
HANOVER,
BRITISH FORCES POST OFFICE 33.

W. G. MACFIE.

Book Reviews

ANÆSTHESIA AND OTOLARYNGOLOGY. By Donald F. Proctor, M.D. Baltimore : The Williams & Wilkins Co. (London : Baillière, Tindall & Cox.) 1957. Pp. 283+xvi. Illustrated. 56s.

This book is in essence a short general textbook on practical anæsthetics with particular reference to the special problems encountered in providing general anæsthesia and local analgesia for surgery of the ear, nose and throat.

The author, who writes from wide experience both as a surgeon and anæsthetist, presents a very complete picture to the reader, dealing in turn with pre-operative care, general anæsthetic techniques, local analgesic techniques and post-operative treatment. He includes a final section on some associated problems, such as respiratory resuscitation and the relief of high airway obstruction.

The text is eminently readable, and the diagrams, drawings and photographs are clear and effective. The book depicts no new and startling aspects of the subject, but rather summarises much that has been established to be sound and sensible in the practice of safe anæsthesia for this branch of surgery. It will be read with benefit and enjoyment by the experienced anæsthetist and is recommended for careful study by those less expert in the speciality. K. F. S.

THE PUBLIC HEALTH INSPECTORS' HANDBOOK. By Henry H. Clay, F.R.S.H., F.I.P.H.E., assisted by Ronald Williams, O.B.E., D.P.A., F.R.S.H. Ninth Edition. London: H. K. Lewis & Co. Ltd. 1957. Pp. 614+xx. Illustrated. 40s.

This new edition of a textbook so well known to Army Health Specialists and Hygiene Assistants is particularly welcome at the present moment.

In the two years which have elapsed since the last edition many changes have taken place in Public Health legislation, especially in connection with food control and atmospheric pollution. These changes are dealt with comprehensively in the present volume.

The only suggestion we would venture to make is that in future editions the chapter on ventilation could be improved by the inclusion of a short section on the use of the corrected effective temperature in the investigation of atmospheric conditions in buildings.

W. M. Mc.C.

BIOCHEMICAL INVESTIGATIONS IN DIAGNOSIS AND TREATMENT. By John D. N. Nabarro, M.D., F.R.C.P. Second Edition. London: H. K. Lewis & Co. Ltd. 1958. Pp. 299+xi. Illustrated. 25s.

The general arrangement of the second edition of Dr. Nabarro's book is the same as that of the first (this *Journal*, **101**, 268). A number of subjects such as bilirubin metabolism and the adrenal cortex have, however, been revised in the light of recent knowledge and new sections dealing with abnormal hæmoglobins and malignant carcinoid tumours have been added. Despite these additions, the text is only a few pages longer and the total number of pages the same as in the previous edition. This has been achieved by some condensation and pruning of the excellent index which, as before, is in two parts, "Index of Investigations" and "Index of Conditions." The price remains unaltered.

This edition gives a concise and up-to-date account of the biochemical investigations and findings which may be of value in the diagnosis of disease without going into any details of the technical procedures involved. It can be confidently predicted that this new edition will continue to prove extremely useful to clinicians and clinical pathologists.

P. D. S.

GASTRO-INTESTINAL OBSTRUCTION. By Meyer O. Cantor, M.D., and Roland P. Reynolds, M.D. Baltimore: The Williams & Wilkins Co. (London: Baillière, Tindall & Cox.) 1957. Pp. 565+xii. Illustrated. 18s.

This is a comprehensive textbook on all aspects of gastro-intestinal obstruction, including œsophageal conditions. It contains a full account of the phenomena arising from intestinal distension. It deals particularly well, as might be expected of the senior author, with gastro-intestinal intubation and decompression. Preliminary chapters deal with developmental anatomy and physiology in an interesting way; further chapters are devoted to the ætiology, investigation

and management of obstructive lesions on a regional basis. Others consider the special features of obstruction in infancy, childhood, the aged, and in pregnancy.

The use of radiology in the diagnosis of obstruction is described and well illustrated in over thirty pages. A section is also given to the organic and functional disorders which may simulate obstruction of the gastro-intestinal tract. A very sound paragraph on p. 263 might have received more prominence as it points out the limitations of the presence or absence of radiological findings. The clinical history and judgment in these cases must remain paramount.

Photographic and radiographic illustrations are plentiful and informative. The bibliography contains some 1,600 references, including some pertaining to this side of the Atlantic. The index contains the names of many past and present workers in this field.

As a criticism, perhaps carping, the reviewer considers that too much space and attention are devoted to intubation, as also to radiology in diagnosis. The less experienced clinician may tarry or be led astray to the detriment of his patient.

This readable and well-produced book is recommended as a reference book for the larger medical library.

J. H.

BROMPTON HOSPITAL REPORTS, VOL. XXVI, 1957 : Brompton Hospital, London Chest Hospital and Institute of Diseases of the Chest. London : Lloyd Luke (Medical Books) Ltd. 1957. Pp. 308+x. Illustrated. 15s.

These selected articles on diseases of the chest by authors from the Brompton Hospital, the London Chest Hospital and the Institute of Diseases of the Chest should be read by all candidates for higher medical and surgical qualifications as well as by medical and surgical specialists.

The article on the prevention of tuberculosis by Dr. W. D. W. Brooks should be in the hands of all specialists of Army Health, particularly those who serve in the Middle East and the Far East, with particular reference to indications for B.C.G. vaccination and chemoprophylaxis.

Of particular interest also are the articles on fungous diseases of Britain and on sarcoidosis.

J. M. D.

SKIN DISEASES FOR BEGINNERS. By R. B. Coles, M.B., B.S., M.R.C.P., and P. D. C. Kinmont, M.B.E., T.D., M.D., M.R.C.P. London : H. K. Lewis & Co. Ltd. 1957. Pp. 43. Illustrated. 7s. 6d.

In this excellent little book, the authors give a very short account of the common skin diseases. They state that they "make no excuses for the omissions, half truths and condensations inevitable in a synopsis." Such a dogmatic approach to the teaching of dermatology is long overdue and therefore very welcome.

The reviewer would differ seriously with the authors only when they do not recommend the local use of antibiotics in skin sepsis. It is considered that treatment of impetigo with filthy ointments is no longer acceptable and the ointments recommended are very filthy. One can see no possible objection to the local use

of neomycin or gramicidin—antibiotics which are seldom used systemically, and which will also cure the condition very much more quickly.

The book will be most valuable for nurses and orderlies. It will also serve as an introduction to dermatology and a framework of knowledge for medical students and doctors, though one hopes that the latter may be stimulated by it to delve more deeply into the subject. It would also seem that these talented authors could expand this work so that, while retaining its dogmatic approach and concise style, it could deal more scientifically with the subject-matter. Such a book would meet a great need.

P. C. M.

RECENT TRENDS IN CHRONIC BRONCHITIS. By various authors, edited by Neville C. Oswald, M.D., F.R.C.P. London: Lloyd-Luke (Medical Books) Ltd. 1957. Pp. 199+vii. 30s.

The importance of chronic bronchitis as a cause of morbidity and mortality among the population of these islands has been over-shadowed in the past by pulmonary tuberculosis and cardiovascular disease. There is no doubt that as a cause of poor health in this country chronic bronchitis is of great importance, and a clear conception of its prevention and treatment is essential.

In this small book the subject is dealt with in all its facets and brought completely up-to-date. There are chapters among others on morbidity and mortality, clinical pattern, physiology, pathology, bacteriology, radiology, pulmonary heart disease, clinical management, and bronchitis in general practice. The authors of the various chapters have all made a special study of the different aspects of bronchitis. There is a useful list of references at the end of each chapter.

I found this book most readable and informative and I would strongly recommend it not only to physicians, general practitioners and hygienists, but to all doctors whose work takes them into contact with patients.

R. A. B.

THE NURSE AND THE DIABETIC. Joan B. Walker, M.D., M.R.C.S., L.R.C.P. London: Iliffe & Sons. 1958. Pp. 120+vii. Illustrated. 10s. 6d.

This book particularly emphasises the part that nurses can play as health educators, with regard to the diabetic patient. It contains a good account of the circumstances under which diabetic patients are met with in hospital wards, and the special treatment they require, together with the complications associated with insulin treatment.

In particular rehabilitation of patients is dealt with, and the help that can be given to the diabetic in his home in order to allow him to lead a life which is as nearly normal as possible. The appendices set out clearly tables of food values, diabetic diets, and recipes which will prove helpful to all those concerned with the care of sufferers from this condition or who may be called upon to advise them.

The book would be an extremely valuable addition to any training library for nurses.

H. P. K. B.

THE DETERMINATION OF THE ABO & RH (D) BLOOD GROUPS FOR TRANSFUSION.
M.R.C. Memorandum No. 36. London: H.M.S.O. 1958. Pp. 46+vi.
3s. 6d.

Brevity and clarity are not invariably associated with blood grouping publications. The production of this modest booklet of a mere forty-six pages is therefore greatly to be applauded. It gives concise and accurate descriptions of the main characteristics of the ABO and Rhesus groups, and practical methods of typing, cross-matching, etc. There are also useful chapters on the collection of specimens, the investigation of untoward transfusion reactions and on the common causes of error in grouping techniques.

Little fault can be found with details. Perhaps even more stress might have been laid on the advantages of the albumin replacement technique over the making of cell dilutions in albumin, the latter being messy, wasteful and time-consuming. The publication might also have been improved by more obvious separation of practical techniques from the general text. This would facilitate its use as a reference work for the bench.

On the whole, it is an admirable production. It is hoped it will become a minor classic of the clinical laboratory and remain so for many years.

A. S. B.

FRACTURES AND DISLOCATIONS. George Perkins, M.C., M.Ch., F.R.C.S.
London: Athlone Press. 1958. Pp. 363+viii. Illustrated. 57s. 6d.

Some doctors fight shy of fractures possibly because in their early days, before gaining practical experience of the subject, they are bewildered by their number and variety, and later because they fear they may fail to recognise the injuries that might affect adversely their reputation or pocket.

The advice given in this economically worded book, aided perhaps by a star-system of award to individual fractures (like hotels), will help us to decide upon the fractures that we may safely treat and those that should be referred to a more experienced surgeon.

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The individual fractures and dislocations grouped on a regional basis are dealt with in the succeeding chapters. Descriptions are terse but lucid. The treatment advised is outlined in characteristically dogmatic fashion and not everyone will entirely subscribe to it. No operative details are given. The results to be expected are stated with candour and truth. Well-produced photographs and X-ray films suitably placed with the relevant text are easy to follow.

The book is well produced and of handy size for a useful companion. The fruits of ripe experience are here for the gathering.

J. H.

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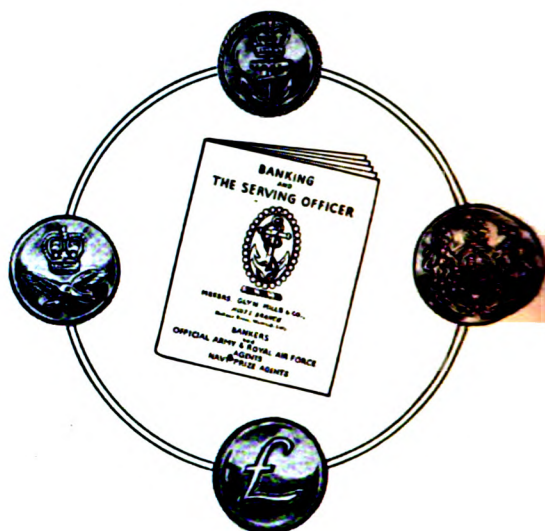
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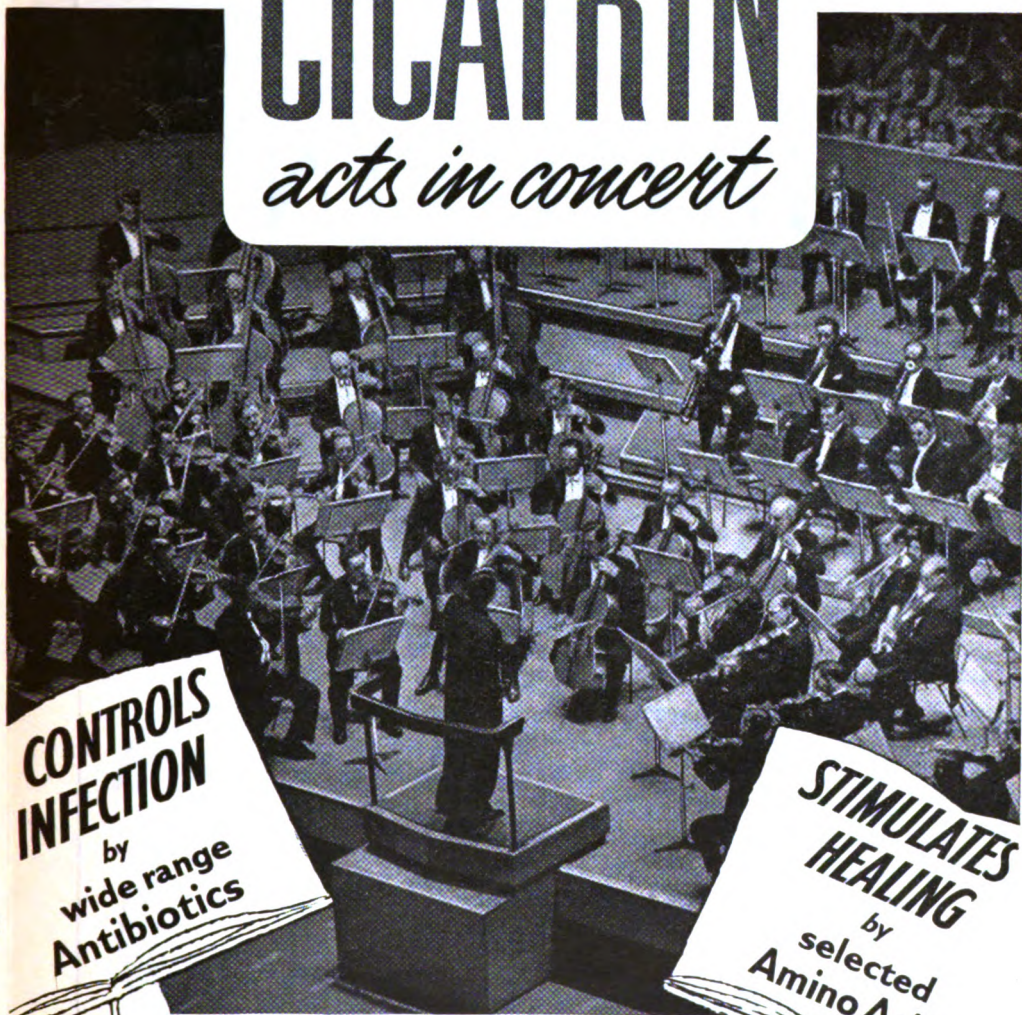
CONTENTS

	PAGE		PAGE
CLINICAL COMMUNICATIONS			
Morale at the Base. By Colonel Neville C. Oswald, T.D., Q.H.P., M.D., F.R.C.P., R.A.M.C. (T.A.)	97	A Trial of Methods for Mass Inoculation. By Colonel M. H. P. Sayers, O.B.E., M.B., B.S.; Major R. C. Stewart, M.B., B.Ch., R.A.M.C., and Captain P. R. Harman, B.S., R.A.M.C.	127
Some Practical Aspects of a Command Transfusion Service. By Lieut.-Colonel H. C. Jeffrey, M.B., Ch.B., D.T.M. & H., R.A.M.C.	101	Schistosomiasis Amongst Rhodesian Troops. By Captain J. F. Ainslie, M.B., Ch.B., R.A.M.C.	131
Ambulance Légère. By Lieut.-Colonel J. C. Watts, M.C., F.R.C.S., R.A.M.C.	111	Seven New Salmonella Serotypes. A report from The David Bruce Laboratories	134
Hæmoglobin Levels and Helminthiasis in Malay Recruits. By Lieut.-Colonel T. E. Field, M.B.E., M.B., B.Ch., D.T.M. & H., R.A.M.C.; Captain P. J. Scheuer, M.B., B.S., late R.A.M.C., and Captain C. R. Tribe, M.A., B.M., B.Ch., R.A.M.C.	113	A Hazardous Anaesthetic. By Captain C. M. Campbell, M.B., B.Chir., D.A., R.A.M.C.	135
Some Clinical Features of Ringworm in Malay and Hong Kong. By Major D. Gill, M.R.C.S., R.A.M.C.	120	Correspondence—Dangers of the Enema. By Colonel D. Wright, D.S.O., O.B.E., M.B., F.R.C.S., late R.A.M.C.	137
Scrub Typhus in the Differential Diagnosis of Venereal Disease. By Lieut.-Colonel B. Levy, M.B., R.A.M.C.	125	MATTERS OF INTEREST	138
		BOOK REVIEWS	139
		EDITORIAL NOTICES	144

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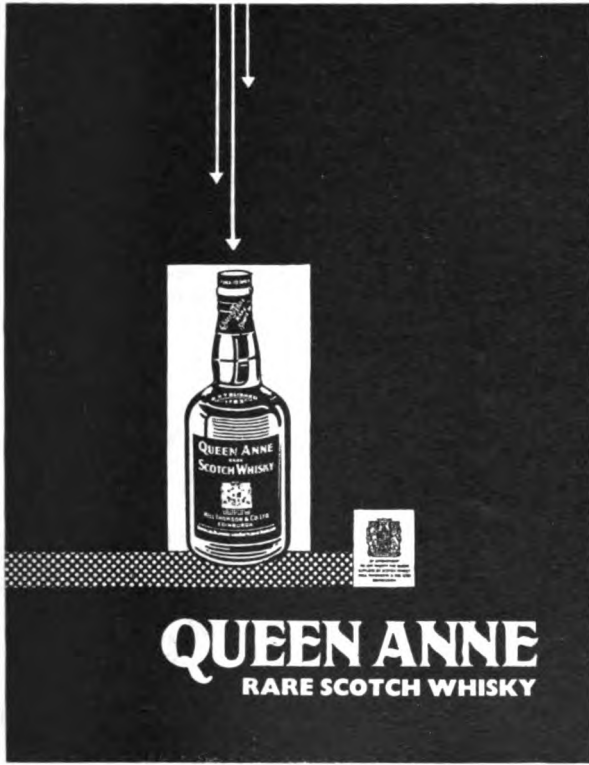
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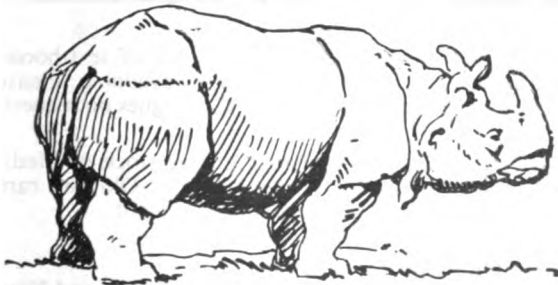
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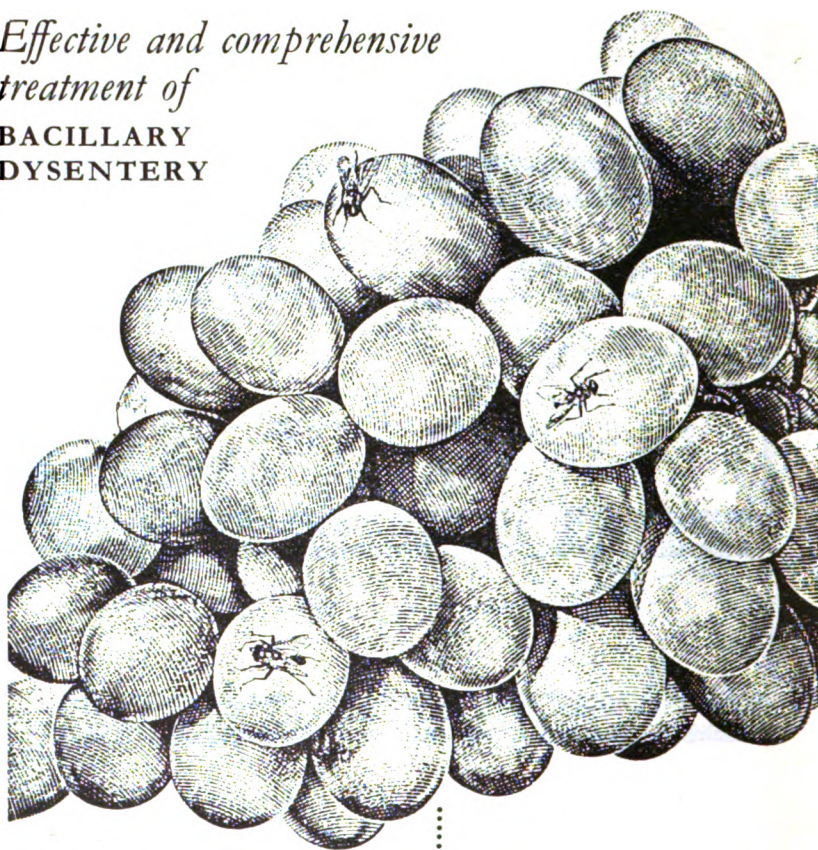
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Journal of the Royal Army Medical Corps

MORALE AT THE BASE

BY

Colonel NEVILLE OSWALD, T.D., Q.H.P., M.D., F.R.C.P.

Royal Army Medical Corps, Territorial Army

Physician, St. Bartholomew's and The Brompton Hospitals, London

MORALE, that fleeting quality which is the constant care of all who take up arms, is a measure of the attitudes and ideals of individual soldiers. It exists from the firing line to the remotest convalescent depot, but derives, as it must always do, from personal emotions. It is conditioned by many circumstances, such as the efficiency of individual units, confidence in the higher commands, and indeed the over-all progress of a war. These are the factors that govern, in the long run, the spirit with which individuals set about their duties whatever they may be, and morale, if it is to serve an army well, must be a bond uniting all ranks in a common endeavour.

Writing as one who is called upon to serve only in times of national emergency and whose overseas experience in war time is limited to three and a half years in base hospitals in the Middle East, I am in no position to pass judgment upon morale in forward areas, nor am I able to overlook the incompleteness of my military experience. However, constant contact with troops who have occupied positions of danger can hardly have failed to leave an impression that morale at the front and the base, although basically the same, has important differences. Perhaps I might be allowed to indicate where the differences lie and to consider some of the difficulties which face the staffs of general hospitals, as seen against the limited background of service in the Middle East, if a high morale is to be maintained.

"Morale up in front is terrific. At the base it is dreadful." This was said by a combatant officer on arrival at our base hospital in Palestine. After weeks of preparation, his unit had moved into position at El Alamein and then, a few days before the battle, he had the misfortune to develop jaundice. He spent the next two days and nights in various types of transport and eventually reached us in the hours of darkness. Obviously, he had many reasons for feeling resentful. Perhaps his reactions during evacuation can be surmised. When he reached a field ambulance, he probably found the general atmosphere to be much as he expected. Being still within the brigade area, the personal factor persisted. Indeed, he may well have had friends in the unit, or at least have known its number and reputation, and the principles of quick recovery or evacuation were in keeping with the tempo of warfare. On arrival at a casualty clearing station, and seeing nursing sisters for the first time, he probably realised that he was becoming less of a soldier and more of a patient. He may have begun to wonder not so much when but whether he would be able to regain his unit. Then, after surviving the rigours of an ambulance train, he is admitted to a general hospital far away from the zone of active engagement. Having been deprived of his local loyalties, he finds himself in an entirely new environment, peopled for the most part by those who, by reason of age, infirmity or special qualifications, are best employed there.

This incident, which refers to a lull between conflicts when the lines of communication were unimpeded, illustrates the changes in outlook that a casualty may undergo when passing through the standard medical units in their classical forms. If the commitments of our Corps were always as simple as this, doubtless the factors influencing morale could be enumerated in an orderly sequence. Unfortunately, warfare is often much more complicated, with units moving to and fro and having no clear demarcation between front and rear. General hospitals, with which we are primarily concerned in this context, can rarely be erected in ideal sites and may well be flooded with casualties before they are fully established. In addition, the staff may be under strength or substantially reinforced from non-British sources. Whether of 200, 600 or 1,200 beds, they are designed to function with their proper number of beds fully staffed. If the number is exceeded or the staff depleted, efficiency suffers. All these variables are bound to influence morale.

Reverting to the officer with jaundice, we should constantly ask ourselves what he expects from a military hospital. Perhaps kindness and efficiency are his greatest needs; kindness because he is ill and efficiency to restore his health and confidence. There is little room for discipline in the accepted sense in hospitals. Instead, if a high standard of efficiency be maintained, the rules have a habit of looking after themselves. This, of course, applies to all good army units, in that enforced discipline is necessary only when efficiency fails. Regimentation, which is by no means the same as discipline, is a function of the medical services. It is ordinarily initiated in convalescent depots, but may be started in the convalescent wings of hospitals. We may assume that our officer patient was quick in forming impressions of our unit. His remarks about morale suggest that he did not approve our arrangements in the reception department, but it is more likely

that they reflected the state of his own. Nevertheless, impressions are made rapidly, and I well remember our feelings when his convoy came in. We had arrived from Britain a few months before and had immediately been distributed among various established military hospitals in Palestine. We had then been given our own hospital and were thrilled to be carrying out the purpose for which we existed. Our main anxiety was that we might fall short of the standards set by neighbouring hospitals with longer experience, so that our morale, which I cannot believe was other than high, was tinged with brittleness. Our shortcomings were soon recognised by the casualties in the first convoys, but, somewhat to our surprise, we were treated as long-lost friends rather than as the greenhorns we knew ourselves to be. Our tents, many of which were flattened by a sudden sandstorm, were quickly secured with the assistance of the more able-bodied casualties. In return, we were held responsible for maintaining an efficient service, especially in the distribution of hot meals and in medical care.

The proper relationships between medical officers and combatant troops, whether within hospitals or without, are a most important determinant of morale. It is made no easier in time of war when civilians comprise the bulk of the army. Most civilian doctors live within the environment of their practices and take people as they find them. Any authority they may have to exercise involves individuals, with whom they deal one at a time. Within limits, they have a wide responsibility and their decisions are rarely questioned. Amongst their many early reactions to army life, they are likely to remember that they possess a specialised and essential skill and, coming from a hardy stock as exemplified by many illustrious names in the more rugged forms of sport and endeavour, they feel that they are as good as the next man. Both reactions are natural and true, but armies exist to win battles and the man who counts is the man with the gun. Medical officers, for all their worth, can never play more than a subsidiary part, but any frustration they may feel at times is more than offset by the opportunities they are given when they are called upon to act. They must learn the lessons of organisation and delegation. When casualties arrive, their medical skill will be quickly, and probably accurately, assessed. They may have to learn almost overnight the routine management of diseases they have not previously encountered, and individual patients will not be slow to detect and comment upon any deviation from standard treatment. A rush of casualties may easily militate against a high standard of treatment, in which case good organisation is essential. In the last weeks of 1942 we regularly had three or four convoys of one hundred to three hundred men in and out each week. There was a waiting list of about four days for the convalescent depot and about a week for the local transit camp. In common with the other general hospitals, we had to anticipate discharge dates for the lightly disabled and ensure that the more seriously ill were retained and cared for by those best qualified to do so. If a happy compromise between organisation and medical skill can be achieved, the morale of our patients will be well served.

Hardly less exacting than the morale of the patients is that of the hospital staff. Medical officers tend to be individualists and are notoriously difficult to

control. Their skills derive principally from civilian experience and their powers of organisation, both natural and acquired, are not always related very closely to their ranks, but, in common with others, they are happiest when they are fully occupied and faced with adversity. The morale of nursing officers also varies with the extent of their nursing commitments. The responsibility of taking eighty sisters, of whom fifty were under the age of thirty, on a two months' voyage around the Cape and then distributing them among four hospitals in Palestine is one that cannot be easily forgotten. Perhaps the outstanding recollections are that above all the matron must be properly accommodated and cared for, and that the most imperturbable sister will be reduced to a state of despondency if she is separated from her more intimate possessions.

In considering the morale of other ranks, the static nature of general hospitals must be remembered. They may move from time to time, and often have to operate in inconvenient places. Sometimes they receive their early casualties within days of arrival, but they are likely to require at least six weeks before they are able to function smoothly and frequent moves should not be lightly undertaken. The problem is not so much the conditions of work, which are dictated by medical commitments, but the facilities when off duty. Places of entertainment, bathing beaches and travelling concert parties may or may not be available. If they are not, and they are by no means essential, that remarkable invention the "regimental institute" is able to provide most of the needs. The selection of a suitable P.R.I., often the second-in-command, is a matter of great importance, for he controls, or should control, sport, entertainment and extra messing. These three are of roughly equal importance, and such funds as are available can equitably be distributed among them in equal amounts. By a process of trial and error, we found that our purposes were best served by holding a meeting of the whole unit three-monthly, at which the P.R.I. presided over a free discussion and the committees for sport, entertainment and extra messing were elected or re-elected. The composition of these committees, which represent all ranks for the purpose of benefiting other ranks, would seem ideally to be an officer, a member of the sergeants' mess, a corporal and two privates, in order that a fair balance in voting may be maintained. Properly run, the committees can go a long way towards ensuring a happy unit.

No account of morale can be complete without mention of the Chaplains' department. Many tragedies are enacted in hospitals and the guidance and assistance of sympathetic parsons can be of inestimable benefit to both patients and staff.

Reminiscences are inclined to be boring, and any major conflict in the future is likely to bear little resemblance to the last war, but basic problems of morale will remain unchanged. Others will be added—for example, fear of the unknown in the event of nuclear explosions. To combat these, reliance must be placed upon the spirit with which individuals carry out the duties they have been taught and of which they are capable, upon unit efficiency and, in the last resort, enforced discipline. The motivating spirit is the complex of all the elements already discussed, but efficiency derives principally from training. The proper

distribution of trained personnel will raise very great difficulties during the first vital six months. At present we have a vast army of young and youngish men who have served for not less than two years with the colours, but the only soldiers who are properly trained are regulars. In field medical units, whether at the front or rear, there are four vital posts, namely the commanding officer, the company officer, the quartermaster and the regimental sergeant-major. We should ensure that not less than two of these posts are held by regulars in every unit, and must not allow units to fend for themselves as they had to do in 1939. Morale is so dependent upon training and efficiency that an untrained unit, if it becomes a rabble under pressure, soon becomes a liability.

I cannot close without mentioning morale in the Territorial Army. Although we have our parachutists and front line volunteers, many of us, by sheer weight of years, gravitate towards the base where, in middle age, we tend to occupy the higher ranks, both commissioned and non-commissioned. Our morale is always high, for as long as we attend our parades. We know our colleagues, we have our equipment and within limits we are trained, but we cannot match full-time soldiers for experience. If we are to become efficient rapidly in an emergency, we need a stiffening of regulars. Alternatively, we are useful nuclei from which fresh units can be formed. I think we are worth retaining.

SOME PRACTICAL ASPECTS OF A COMMAND TRANSFUSION SERVICE

BY

Lieut.-Colonel H. C. JEFFREY, M.B., Ch.B., D.T.M. & H.

Royal Army Medical Corps

PREVIOUS articles in this Journal have described some of the practical aspects of transfusion work in a station hospital (King, 1956) and the organisation of an Army Blood Bank (Lunn & Turk, 1957). A number of official directives are in existence covering the administrative and technical details concerning transfusion. This article is designed to describe how these may be translated into practice, particularly overseas, under peace-time conditions, in such a way as to satisfy the clinician, with his often urgent demand for blood, and the pathologist whose duty it is to ensure that blood issued is safe to give.

ORGANISATION

In the United Kingdom the National Blood Transfusion Service provides hospitals with bottles of grouped blood, banks being replenished at stated intervals or as necessary, and the hospital transfusion service need only be

concerned with arrangements for the care of the blood and checking its suitability for transfusion to any particular patient. Abroad, however, it is seldom that such comprehensive arrangements exist, and the Army Transfusion Service requires an organisation dealing with the donor aspect as well.

To this end a panel of donors is maintained in all overseas stations, under the general supervision of the senior pathologist in the Command or District, and in hospitals under the particular supervision of the pathologist in collaboration with the transfusion officer. The transfusion officer should not be the pathologist, in order that at least two medical officers have special knowledge of the transfusion arrangements so that cover is provided should one be absent from duty. Frequently the choice of transfusion officer falls on the anaesthetist, who is specially trained in resuscitation measures. One objection to such a choice is that, in emergency, transfusion and anaesthesia are frequently required at the same time, but every medical officer should be capable of bleeding donors and giving blood, and the orderly medical officer is always available for such duties in emergency.

The pathologist's duties in connection with the transfusion services include the blood grouping of donors and recipients, compatibility tests, the care of stored blood, the testing of whole blood, plasma and plasma substitutes to ensure their suitability for transfusion, collaboration with the hospital transfusion officer, and the maintenance of records.

The duties of the transfusion officer include the maintenance of a panel of suitable donors, the bleeding of donors as required, the transfusion of recipients and the duties of the pathologist if such a specialist is not available.

Blood for transfusion is obtained by bleeding donors at the time that transfusion is required, or initially in emergency from a small blood bank.

THE DONOR PANEL

The donor panel should be divided into two main groups :

Those to be summoned in an emergency. The donors in this group should be from hospital personnel, augmented if necessary from a major unit in close proximity to the hospital. Minor units should not be used for this purpose if it can be avoided as in emergency much time can be wasted contacting such units and finding that the few suitable persons are out. Men from such units should be on the non-urgent panel. The size of such an emergency donor panel will depend largely on the number of men and families in the station, the general nature of military training (as regards the incidence of accidents) and the scope of hospital practice. It should be based on average transfusion requirements in the past, with an adequate reserve to cover major incidents and, since it is for use in emergency, often after duty hours, to have a reasonable assurance that sufficient donors can be found actually present in their units. This is not the problem it may appear, however, as in general, army personnel overseas can be found in relatively few places after duty hours—in billets, the Services' clubs or the cinema.

The following figures are suggested as the minimum requirements for this type of panel :

Type of donor	Bed strength of hospital		
	Up to 100	100-400	400 or over
O Rh negative	6	8	10
O Rh positive	12	16	20
A Rh negative	4	6	6
A Rh positive	12	16	20
B Rh positive	6	8	10
Number of donors requiring investigation to produce at least this number of Rh negative groups	100	135	175

(Note : Other ABO and Rh combinations only to be included if found during investigation for the above groups.)

Home Commands should consider maintaining similar donor panels in connection with each military hospital so that blood may be available should adverse road conditions, particularly fog, preclude rapid replenishment of their blood banks.

Those to be used in non-urgent cases and for the replenishment of a blood bank if maintained. The donors in this group should be from any unit in, or in reasonable proximity to, the station, preferably from the more static ones in view of the possible protracted absence of field units on manœuvres. Again the size of such a panel will vary according to local factors ; the following are suggested as minimum figures to be aimed at.

Type of donor	Bed strength of hospital		
	Up to 100	100-400	400 or over
O Rh negative	10	25	30
O Rh positive	30	60	80
A Rh negative	6	8	10
A Rh positive	30	60	80
B Rh positive	10	16	20
Number of donors requiring investigation to produce at least these figures of Rh negative groups	175	400	500

(Note : Other ABO and Rh combinations only to be included if found during investigation for the above group.)

Selection of donors

Volunteers should not be placed on the panel if they have a history of malaria, of venereal disease, of infective hepatitis, of acute or chronic infections including those of the skin, or arm veins unsuitable for donation.

Before a donor is bled a number of points require investigation. The hæmoglobin level of the blood should be estimated. In army practice male donors with less than 13.5 g. per cent should be rejected. Female donors or males in civilian practice with a hæmoglobin level above 12.5 g. per cent may, however, be accepted. This is a general rule. In emergency, for life-saving purposes, it

may be necessary occasionally to bleed a donor before this check, but the hæmoglobin value should always be estimated in such cases at leisure afterwards and appropriate therapy instituted if indicated. As a general rule if a man has donated blood within the previous six months he should not be bled again. If an appropriate donor cannot be found, however, it may be necessary to bleed more often than every six months (even once in three months), particularly if large quantities of Rh negative blood are required. This should only be necessary in exceptional circumstances, and if a man is bled more frequently than every six months he should be given a month's course of some suitable iron preparation after each donation. The donor should be asked if he is attending a venereal disease treatment centre (Special Treatment Centre) and rejected if the answer is in the affirmative. Enquiry should be made as to whether the man has been vaccinated or inoculated recently. The recently vaccinated should not be used as donors until the scab has formed and separated; bleeding should not be carried out within four days of inoculations.

After a donor is bled a specimen of blood should be obtained from the taking set and a Kahn test performed at leisure. If it is positive, action should be taken to investigate the donor, and to follow up the recipient if the blood has already been given.

Investigation of donors accepted for the panel

Panels should be revised at least every six months. At this time a nominal roll of those on the panel should be submitted to the unit concerned for checking, and the names of those who have left the station removed from the panel. The number requiring investigation to bring the panel to the desired level should then be calculated, from the approximate figure that 6 group O Rh negative donors will be found per 100 men investigated. Requests to units for at least this number of volunteers should be made. If close co-operation is maintained with unit commanders, personal contact being of much greater value than correspondence in this connection, it should not be difficult to get sufficient volunteers who have, as far as can be envisaged, at least six months to serve in the station and who are in possession of National Blood Transfusion Service (NBTS) Cards. (Teams from the NBTS visit most centres receiving recruits in the U.K. and issue cards showing the ABO and Rh group to those donating blood. Most men willing to give blood will probably have already done so in recruit centres and be in possession of these cards.)

Anti-rhesus sera cannot be obtained in unlimited quantities as it is all obtained from human volunteers with suitable antibodies in their blood. Stocks must hence be conserved as far as possible. It is also desirable to reduce technical work in connection with maintenance of donor panels as far as is reasonable. To achieve these objects, the following steps are suggested.

For those to be used in emergency cases. The ABO group in all instances should be checked by the five-tube method, whether the donors are in possession of NBTS cards or not.

If sufficient Rh negative donors can be found from those in possession of

NBTS cards, the Rh group of these negative donors should be checked. This should be carried out by such combinations of anti-Rh sera as are available so that the red cells are tested for the presence of the C, D and E factors, and individuals should only be accepted as Rh negative for *donor* purposes if they are negative to all three factors, *i.e.* if their Rh genotype is *cde/cde*. Those documented as Rh positive, who will be used for Rh positive recipients, need not be checked for the Rh group.

If the number giving the required combinations of ABO and Rh groups is insufficient, further volunteers will need to be ABO grouped. Those found in the ABO groups in which insufficient Rh negative donors are available should then be Rh grouped.

It is preferable to test donors initially with anti-D serum since it is important to know this should a donor at any time become a potential recipient. The use of anti-C + D initially, for example, would show an individual who has *Ccdd* as Rh positive, which as a recipient he is not. D-negative donors would then be tested with anti-C + D or anti-C, followed by anti-D + E or anti-E. If supplies of anti-D serum are insufficient for screening donors, other combinations of sera (*e.g.* anti-C + D followed by anti-E) should be used. It is, however, most important to remember in such cases that, should an "Rh positive" man on the donor panel become a prospective recipient, his Rh group must be ascertained *de novo* using anti-D serum *only*.

For those to be used for non-urgent cases and the maintenance of blood banks if established. An endeavour should be made to obtain sufficient volunteers of each ABO, Rh combination required from those in possession of NBTS cards. These are accepted as documented until required, the ABO group being checked always and the Rh groups of Rh negative donors being checked before bleeding. The Rh group of donors to be used for Rh positive recipients need not be checked. If the number of volunteers with NBTS cards giving the desired combinations of ABO and Rh groups is insufficient, further donors will have to be grouped as described above.

(Note : In performing mass venepunctures (and the ABO group should be ascertained by examining the serum for antibodies as well as the cells for antigens) a convenient method is to have sufficient needles with about 6 cm. pieces of rubber tubing attached and sterilised with the needle by autoclaving. If the tourniquet is adjusted satisfactorily and the subject opens and closes his fist while blood is being withdrawn, ample blood can be obtained without suction using an ordinary venepuncture needle.)

Records of donors

The most convenient method of keeping records of donors is by means of a card system. Constant deletions from and additions to a book soon become unsightly and, unless new pages are prepared each time the panel is renewed, order is soon lost. With a card system those of donors who have left merely need to be abstracted and destroyed, those of new donors can be inserted in their correct place, and those of resting donors easily segregated. As a refinement,

different colours can be used for the different ABO combinations. These should conform to the colours used for the Army Blood Donor Cards—*i.e.* blue for Group O, yellow for Group A, pink for Group B and white for Group AB. A red line down the centre of such cards or cutting off the top right-hand corner denotes an Rh negative group. To render calling forward of donors as simple as possible, cards should be filed in two boxes marked “emergency” and “non-urgent,” under ABO, Rh combinations in alphabetical order of names by units. When a donor is bled an appropriate entry is made on the card which is abstracted to a “resting” file kept in chronological order and reviewed monthly, at which time cards of those who have completed the requisite rest period can be put back into the appropriate donor panel.

A suitable format for such cards is :

<b style="font-size: 2em;">AB Rh Pos			
NAME..... RANK..... NUMBER.....			
UNIT.....			
REF. No. OF GROUPING.....			
DONATIONS			
DATE BLED	Hb	KAHN	BRING FORWARD

TAKING OF BLOOD

The transfusion service is completely dependent on the good will of donors : therefore the greatest care is necessary to ensure that no accidents or causes of dissatisfaction arise. Every consideration should be given to donors, as those who are satisfied will return, but the sight of a donor fainting, or of a bruised arm after a person has given blood, may discourage others from volunteering.

Care must be taken to prevent air embolism. If negative pressure is used, the means of producing it must be tested : *e.g.* if a reversed Higginson's syringe is used, it must be ensured that it is in fact reversed. If the air outlet becomes ineffective there is a possible danger of air embolism when the arm constriction is released, as positive pressure may have built up in the bottle. The glass window in the blood line must be watched. As the blood line is full at the end

of donation, no harm should follow if the needle is removed, or the blood line clamped, immediately the constriction of the arm is released.

Steps must be taken to prevent syncope. After the removal of a pint of blood the blood pressure is maintained immediately by vasoconstriction and restored during the next three to ninety hours by tissue fluids. One pint can usually be withdrawn without ill-effects, but if more is withdrawn, or occasionally after only one pint has been taken, or if the donor is affected psychologically, the blood pressure may fall dramatically with symptoms and signs of pallor, cold clammy skin, yawning, nausea and a desire to pass urine or fæces. The chief danger after blood donation, however, is an exaggerated response to posture, the fall in blood pressure on standing up being twice that of normal persons, and prolonged up to thirty seconds. This exaggerated response to posture may well be found five to six hours after donation and it may occur to some degree even after the loss of one pint of blood. To minimise the risk of syncope, immediate or some hours after donation, donors must be bled lying down and they should remain recumbent for at least fifteen minutes afterwards. They should then be given a drink, should sit up slowly under observation, be helped to a rest couch and remain there for a further half an hour.

Hæmatoma formation at the site of venepuncture discourages further donations. Such a hæmatoma may follow the passage of the needle either too far or not far enough. The needle should have a short bevel. Apart from that the prevention of a hæmatoma is a question of technique.

The venepuncture should be as painless as possible. A sharp needle is essential and a local anæsthetic may be used. Some consider that there is but little difference in the pain caused by the passage of the taking needle and that caused by the needle of the hypodermic syringe containing a local anæsthetic, and that local tissue swelling by the anæsthetic may partially obscure the vein increasing the danger of inaccurate venepuncture and consequent hæmatoma formation. Whether a local anæsthetic is used or not is a matter for decision by the medical officer taking the blood.

Reaction to antiseptics must be prevented. Staining, soreness or even dermatitis may be caused by the antiseptic used, particularly tincture of iodine in hot climates when the spirit may have partially evaporated, producing a strong irritant. Cetrimide is probably preferable to iodine.

It is important to avoid more than one venepuncture. The ability to take a full pint of blood from a donor with one taking set depends largely on the state of the inside of the taking needle and on the experience of the operator. If the needle has a small bore (less than 18/10) a certain amount of negative pressure may be desirable, which can be obtained readily by the use of a reversed Higginson's syringe. The bevel of the needle should be directed downwards when in the vein either by introducing it in that position or by turning it through a half-turn if it has been introduced bevel upwards as is the common practice. This prevents interference with the flow of blood by the wall of the vein being sucked against the aperture of the needle, and is especially important if negative pressure is being used.

THE BLOOD BANK

With an adequate emergency donor panel from hospital personnel, such a bank should only be kept overseas if emergency demands, as experienced in the past, justify it. In a large transfusion centre, embracing a number of hospitals administered by the same regional service, waste of blood can be minimised by removing blood from a small bank a week before it is time-expired and using it in a hospital with large demands for blood. This is seldom feasible in army practice, and, as transfusion demands vary widely, much blood will be wasted by becoming time-expired should banks be kept unnecessarily or on too large a scale. Should the fact that blood is being wasted become known to potential donors, reluctance to donate blood may arise and legitimate demands may not be met.

The hospital blood bank should be near but, in order to minimise the possibility of contamination, not in the laboratory. If a transfusion room is available it should be kept there. The bank should be under the personal supervision of the pathologist or the transfusion officer if no pathologist is available. For routine purposes blood must be stored at a temperature between 4° and 6° Centigrade, and an alarm system should if possible be incorporated to give warning whenever the temperature rises above 6° C. or falls below 4° C. A maximum and minimum thermometer should also be provided, as an alarm bell might not be heard in off-duty hours. Readings should be recorded every morning and evening.

Blood up to 21 days old may be safely transfused and, subject to the advice of the pathologist, blood up to 28 days old may be given in small quantities. If a massive transfusion is required, blood under 14 days old is particularly required, but in the transfusion services overseas, the particular service under discussion, blood for such purposes will be fresh from donors except possibly for the first few bottles.

Points about maintenance of supplies and conditions of storage and issue are best dealt with in Standing Orders for the Maintenance of Blood Banks which should be drawn up in poster form and displayed above the blood bank. Certain details of such orders may vary according to local conditions ; a specimen of how such orders could be drawn up follows.

STANDING ORDERS FOR THE BLOOD BANK

1. *Supervision*

This blood bank is under the personal supervision of :

(The officer responsible is named here.)

2. *Maintenance of supplies*

(a) Normal holdings of blood will be

Group O Rh positive	...	2 bottles
Group O Rh negative	...	1 bottle
Group A Rh positive	...	2 bottles

(b) Should blood from this stock be used, the supervising officer will request the hospital transfusion officer to arrange replenishment as soon as is practicable, certainly before the next day.

- (c) Blood not used within 21 days of taking will be removed from the blood bank refrigerator and either discarded or used for purposes other than transfusion under the orders of the supervising officer. If the blood is not immediately poured away a conspicuous label "DANGEROUS FOR PATIENTS" will be attached and the bottle removed from the transfusion room to some other refrigerator.

3. *Conditions of storage*

- (a) NOTHING other than blood and material for grouping and typing will be placed in this blood bank.
- (b) The maximum and minimum thermometer will be read every morning and evening by the transfusion technician and the result entered on the chart displayed beside the cabinet.
- (c) The supervising officer will make a daily inspection of the bottles of blood and the temperature chart. The bottles should have a clear line of demarcation between the sedimented cells and the supernatant plasma, which should be straw-coloured and free from visible signs of hæmolysis. Hæmolysis is shown by a reddish-purple discoloration in the plasma immediately above the cell layer, which gradually spreads upwards. Such blood should be discarded.
- (d) Blood must be kept at 4° — 6° C. by refrigeration or other method of cold storage (see para. 5 (a) below) except for any period necessary for examination or transport at higher temperatures. Any such period must NOT exceed 30 minutes, after which the blood should immediately be cooled again to 4° — 6° C. If this is not done, the blood must be discarded.

4. *Condition of issue*

- (a) Bottles of blood will always be inspected before issue. (Regarding para. 3 (c) above, however, it must be remembered that good quality blood once shaken may take many hours or even days to settle.)
- (b) A record of all blood issued will be kept on A.B. 129, showing the reference number of the bottle, the date and time of removal, and the patient for whom it is used.
- (c) Blood will only be issued immediately prior to transfusion and then only to a duly appointed member of the laboratory or hospital staff.
- (d) Concentrated cells will only be used within 12 hours of preparation.
- (e) Bottles of blood which have been opened or punctured for sampling but not used within 24 hours may be retained for a further period in the blood bank, or be otherwise disposed of at the discretion of the pathologist.

5. *Bottles returned*

- (a) In certain circumstances it may be necessary to keep blood standing by the side of a patient. In these cases it will be issued in special containers complete with ice insert. If blood so issued is not used it may be returned to the blood bank only if its temperature has not risen above 10° C. The only practical guide as to its good condition is the presence of ice in the insert. If no ice is present such blood must be discarded.

- (b) Bottles not so refrigerated in special containers will not be accepted back unless the period outside the refrigerator has been less than 30 minutes (as in 3 (d) above).
- (c) Partially used bottles, and the dregs of used bottles, will not be placed in the blood bank, but stored in some other refrigerator for 24 hours in case investigation into a reaction is indicated.

THE TRANSFUSION ROOM

In order that blood grouping and cross-matching may be carried out with as little interference as possible, and to have all necessary equipment and reagents readily to hand, it is desirable that a special room be fitted out as a transfusion room, preferably with a room for bleeding donors next door. Should accommodation preclude this, a special bench should be earmarked for transfusion work and used for no other purpose. If the supply of equipment permits, items for transfusion work (microscopes, centrifuges, etc.) should be kept for this purpose only. If the supply situation requires that equipment has to be used for other purposes, it should be replaced in the transfusion room, or on the transfusion bench, before duties are dismounted, in case of a night emergency. The design of such a room will vary according to what is available locally.

TRAINING

While the most experienced technician should normally undertake technical work in connection with transfusion, he may not always be available in an emergency, and it is most important that all technicians on the duty roster on call are thoroughly conversant with procedures required and the practical details involved in carrying them out. To aid this a chart is displayed in the transfusion room detailing the steps which have to be taken before blood is issued to patients (this chart is illustrated in Plate I). The detailed steps in each procedure are printed out on sheets of paper, suitably protected by transparent material, and these should be ready to hand in the transfusion room.

In addition, practice is essential to maintain a high degree of technical competence, and hence it should be a routine in any laboratory dealing with comparatively infrequent transfusion work that every technician on call perform an emergency blood grouping and cross-matching (including an Indirect Coombs test) weekly. To achieve this, arrangements should be made for all technicians who have not carried out such procedures during any one week for actual cases to perform them on practice samples on a convenient, specified day. This is considered a most essential aspect of the arrangements for emergency transfusion.

SUMMARY

Practical details regarding the maintenance of donor panels, blood banks and transfusion rooms for a static transfusion service are described.

PROCEDURES BEFORE TRANSFUSION WITH WHOLE BLOOD		WHOLE BLOOD	
EMERGENCY CASES		NON - URGENT CASES	
MEN WITH NO HISTORY OF PREVIOUS TRANSFUSION		COMPLETE SERIES OF TESTS SHOULD BE CARRIED OUT IN ALL CASES IN ORDER TO AVOID TECHNICAL COMPLAINTS IN PRACTICE. IN MALES WITH NO PREVIOUS TRANSFUSION HISTORY IT MAY BE SUBSTITUTED BY A SIMPLE ALBUMIN CROSSMATCH AND TITRATION, AS DESCRIBED HERE AND THEREABOUTS.	
A EXCEPTIONALLY	IF THE PATIENT HAS BEEN TRANSFUSED WITH BLOOD IN THE PAST 24 HOURS	1 CHECK REQUEST FORM	
B GENERALLY	IF THE PATIENT HAS BEEN TRANSFUSED WITH BLOOD IN THE PAST 24 HOURS	2 PREPARE RECIPIENT BLOOD	
1 CHECK REQUEST FORM		3 ABO GROUP OF RECIPIENT	
2 PREPARE RECIPIENT BLOOD		4 Rh GROUP OF RECIPIENT	
3 RAPID ABO GROUP OF RECIPIENT		5 SELECT DONOR BLOOD	
4 RAPID Rh GROUP OF RECIPIENT		6 STERILITY TESTS ON BANK BLOOD	
5 SELECT DONOR BLOOD		7 PREPARE DONOR BLOOD	
6 STERILITY TESTS ON BANK BLOOD		8 TITRATE DONOR AGGLUTININS	
7 PREPARE DONOR BLOOD		9 CHECK DONOR ABO GROUP	
8 CHECK DONOR ABO GROUP		10 CHECK DONOR Rh GROUP	
9 CHECK DONOR Rh GROUP		11 CROSSMATCH BY ALBUMIN	
10 RAPID ALBUMIN CROSSMATCH		12 CROSSMATCH IN SALINE	
11 RAPID SALINE CROSSMATCH		13 INDIRECT COOMBS TEST	
12		14 COMPATIBILITY LABEL	
13 COMPATIBILITY LABEL		15 ENTER DETAILS IN RECORD BOOKS	
14 ENTER DETAILS IN RECORD BOOKS			

PLATE I—WALL CHART OF LABORATORY PROCEDURES

This chart is reproduced in poster form, approximately 45 × 31 inches, suitably framed. The heading "Emergency Cases" and the three boxes below, the numbers in the first two columns and the note at the foot of the chart are in red.



PLATE II

Side, front and rear views of the three ambulances described in the text.

It is a pleasure to acknowledge the helpful advice I have received from Major-General G. T. L. Archer, Dr. W. d'A. Maycock and Lieut.-Colonel P. D. Stewart, R.A.M.C., in the preparation of this article. My thanks are also due to Captain R. M. Atkinson, R.A.M.C., for the diagram.

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AMBULANCE LÉGÈRE

BY

Lieut.-Colonel J. C. WATTS, M.C., F.R.C.S.

*Royal Army Medical Corps**Simplicate and add more lightness.*—RIED RAILTON*Weight is of value solely to the designer of a steam roller.*—UFFA FOX

As chief instructor and medical officer to the Services' Ski-ing Leave Camp at Troodos in the Olympus Mountains of Cyprus, it was forcibly brought home to the writer that there is at present no suitable ambulance car for the evacuation of wounded over snowbound mountainous roads. Only two ambulance cars are at present in use, the Car, 5 cwt. 4×4 stretcher and the Ford "Thames" car ambulance. The former provides no weather protection and the patients suffer from cold and exposure, but it had perforce to be used as the latter could not be manœuvred on the steep and winding tracks of Mount Olympus.

Marshal Larrey, Napoleon's Chief Medical Officer, was a man of parts as, in addition to his organising ability, professional skill (he was the first to realise that gas gangrene occurred only in devitalised muscle) and administrative talents, he was of an inventive turn of mind, designing the "Ambulance Légère," a light stretcher-carrying phaeton capable of rapid and comfortable evacuation of the wounded. In this respect he was more fortunate than his British opposite number, Dr. McGrigor, who was reprimanded by the Duke of Wellington when he commandeered the returning forage waggons to serve the same purpose.

Stimulated by his experiences at Troodos, the writer has given some thought to the design of a suitable light ambulance, and carried out a few experiments. The expensive débâcle of the "Champ" suggested that the fate of a design *de novo* would be macabre and that the modification of an existing vehicle presented a more practicable proposition. Fortunately a suitable vehicle exists in the long chassis Land-Rover, and an additional advantage is that the normal Land-Rover is already used by the Army and therefore servicing presents no problems. The only modifications required to the long chassis Land-Rover are :

- (a) Lengthening the body eight inches by shifting the rear panels and tailboard back ; this is to allow for the handles of the stretcher ;
- (b) Fitting troughs for the lower stretcher runners ;

- (c) Fitting "Flint" or similar stretcher gear for the two upper stretchers; and finally
- (d) Weatherproofing the vehicle.

Unfortunately a long chassis Land-Rover was not available for the experiment, so a normal production station waggon was used; this, of course, is not suitable for deep mud or cross-country work in wet weather because of the lack of front wheel drive and the low ground clearance, but it did enable a few tentative trials to be carried out.

The relevant data of the vehicles are shown in Table 1. Plate II shows front, back, and side views and is self-explanatory. Only three stretcher cases could be loaded into the station waggon as the fourth interfered with the driver, but the additional length of the long chassis Land-Rover would permit a fourth to be loaded, thus giving it the capacity of the Ford ambulance car, and twice the capacity of the Car, 5 cwt. 4×4 .

It must be remembered that the ambulance car journey is the most shocking event in a wounded man's progress back to health, and the increased comfort of the lighter, better-sprung vehicle, coupled with the shortening of the time of evacuation achieved by the smaller, faster vehicle, contributes materially to the well-being of the patient. Some comments by the experimental victims illustrate this:

Private W.: "I could go to sleep in the station waggon, but the ambulance made me feel sick."

Corporal T.: "Far less jolting in the station waggon, and the journey took only half the time" (in fact a saving of only 20 per cent was achieved, but the greater comfort made it seem shorter).

Sapper B.: "Smashing radio in the station waggon." This comment may appear irrelevant, but music is most helpful in soothing the patient and distracting him from his discomfort; in addition, provision of a receiving wireless in an ambulance would permit re-routing it while under way, and a two-way wireless would enable the orderly to report on the patient's condition and obtain radio assistance in emergency.

The apparent objection to the smaller ambulance is, of course, the lack of space in the vehicle compared with the present juggernaut, but if only two cases are taken there is still sufficient room to examine and attend to them, and it is rare for the present ambulance to be used to capacity when carrying serious cases. In convoy evacuation it is unlikely that the cases will need much attention *en route*, and the disadvantage of lack of space is to some extent overcome by having the patients, attendant and driver in the same compartment, so that any alteration in the condition can be instantly observed. Furthermore, the driver can inform the patients of changes in road surface, corners and hills, so that they do not have to meet these shifts unaware. Good body sealing with an adequate heater of the constant flow type (not the recirculating or "fugstirrer" model) should be a *sine qua non*; it is noteworthy that, on the station waggon used, the body sealing is such that closure of the doors is difficult when all the windows are closed.

SUMMARY

There is a need for a light all-weather ambulance for service use.

A suitably modified long chassis Land-Rover would form a suitable vehicle.

Experiments with a normal station waggon have shown that such a vehicle is speedier and more comfortable than either of the present service ambulance cars.

As such a vehicle can do all that the present vehicles can do, and is only one-third the cost of the present ambulance, with running costs in proportion, it could probably replace the latter vehicle altogether.

I should like to express my thanks to Lieut.-Colonel J. N. Hamill, R.A.M.C., and Major S. R. Farmer, R.A.O.C., for their help, and to Major J. Brodribb, F.F.R., R.C.S., R.A.M.C., for taking the photographs.

Table 1

Ford Thames Ambulance	Land-Rover	Station Waggon
Price £2,300	£636	£570
Weight 10,875lb.	3,300lb.	2,400lb.
Fuel consumption 8-12 m.p.g.	16-24 m.p.g. (petrol) 30-45 m.p.g. (diesel)	32 m.p.g.

HÆMOGLOBIN LEVELS AND HELMINTHIASIS IN MALAY RECRUITS

BY

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ANÆMIA in the tropics is much more prevalent than in the United Kingdom, particularly amongst the indigenous inhabitants. It was therefore decided to investigate the hæmoglobin levels of a group of Malay recruits. These men had previously lived in Malay villages and entered the Army direct from civilian life. It was considered important to correlate the incidence of ancylostomiasis and other helminth infestations with the hæmoglobin levels of the recruits. In addition it was decided to try to determine any relationship between helminth infestations and peripheral blood eosinophilia. Investigations were carried out before and after initial training to correlate the effect of Army dietary changes and training on the hæmoglobin levels of the recruits.

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Previous investigations carried out by Wadsworth (1952a, 1952b and 1954) in Singapore had shown that healthy people of all races living in a tropical climate had normal packed red cell volumes, red cell counts and hæmoglobin levels. The poorer classes of the population were not included in Wadsworth's investigations. Robertson (1957) found no anæmia in an investigation of 212 mothers from lower income groups in Singapore. In this series, however, only two of the mothers were Malay, the remainder being Chinese and Indian. Millis (1954) found only one case of anæmia among 106 infants of the poorest and worst-fed section of the Singapore population.

Stewart, Yeates & Barnfather (1957) in a survey of hæmoglobin levels in British Army recruits and trained soldiers found that the mean hæmoglobin level of 229 British soldiers showed no appreciable change from previously reported values for healthy males. Manson-Bahr (1958) is of the opinion that most forms of anæmia in the tropics cannot be ascribed to dietary deficiencies and incriminates ancylostomiasis as a major cause. McNaught (1958) agrees with Manson-Bahr that diet has little if anything to do with anæmia, and states that in Assam treatment for hookworm infestation alone produces a dramatic improvement in anæmic patients. Meiklejohn & Passmore (1958) point out that the association between hookworm infestation and iron deficiency anæmia is almost traditional, but that in recent years serious doubts have been expressed as to the truth of this assertion. They suggest that a properly financed research project into the association between hookworm infestation and anæmia is overdue. Foy & Kondi (1957), two hæmatologists with wide experience in the tropics, have summarised present views as follows :

"The concensus of opinion is that hookworms are not a common cause of anæmia, but until more critical work has been done it is better to leave the question open."

MATERIAL AND METHODS

A total of 143 Malay recruits were investigated shortly after joining their basic training unit. Samples of capillary blood were obtained by finger prick and the hæmoglobin concentration estimated by the oxyhæmoglobin method and M.R.C. Grey Wedge Photometer (King *et al.*, 1948). The photometer was frequently checked with the calibrated neutral glass standard and also with Keeler's artificial hæmoglobin standard. Stool specimens were also obtained from each of the recruits at the start of training. Only a single stool examination was carried out on each recruit. The stools were examined for the ova of intestinal parasites, using Hung's simple floatation method (Manson-Bahr, 1954). This simple concentration method gives particularly good results with ancylostoma ova, and by experience had been found to give reasonable results with the ova of other intestinal parasites. No attempt to exclude *Strongyloides stercoralis* was made. The stools were all formed and no rhabditiform larvæ were seen, so it was assumed that we were dealing with ancylostomes. At the conclusion of the recruits' training, thirteen weeks after the initial hæmoglobin levels had been determined, a further hæmoglobin estimation was made using

the technique previously described. In order to eliminate errors as far as possible, the two hæmoglobin estimations were performed at the same time of the day by the same technicians. Peripheral blood films were made from each Malay recruit at the time of each hæmoglobin estimation and were stained by Leishman's stain. These were examined later and differential counts performed to give an average eosinophil percentage. No total white cell counts were performed and no further stool examinations were carried out at the end of training.

RESULTS

Incidence of Helminthiasis

Only three of the 143 recruits examined showed no evidence of helminthiasis. The results obtained on one examination of a single stool from each recruit are given in Table 1.

Table 1. *Number of positive results following single examination of stools of 143 recruits.*

Ova of	Number positive	Per cent
<i>Ancylostomes</i> ...	111	77.6
<i>Ascaris lumbricoides</i> ...	75	52.4
<i>Trichuris trichiura</i> ...	94	65.7

A total of 280 worm infestations were found in the 143 recruits as many of the recruits had a double or even triple infestation with the different helminths named. The examination of each stool was purely qualitative and no effort was made to carry out a quantitative estimation as to the severity of each helminth infestation. It was felt that the high positive results obtained might well have been increased if time had permitted an examination of a second stool specimen from each recruit.

Initial hæmoglobin concentrations in Malay recruits

A hæmoglobin estimation was made on each recruit using the Grey Wedge Photometer as already described. The results obtained are given in Table 2.

Table 2. *Results of hæmoglobin estimation before training.*

Hæmoglobin		Number of recruits
Per cent	Grams per cent	
Over 90	More than 13.3	25
80-89	11.8-13.2	42
70-79	10.4-11.7	33
60-69	8.9-10.3	25
50-59	7.4-8.8	13
40-49	5.9-7.3	5
Total		143

The average hæmoglobin concentration of all recruits was 76.7 (11.3 g.) per cent.

Final hæmoglobin concentration in Malay recruits after training

A second hæmoglobin estimation was made on each recruit at the conclusion of initial training which lasted thirteen weeks. During this period the recruit received no treatment for his helminthiasis and no extra iron was provided. Care was taken to ensure that the Grey Wedge Photometer was calibrated to the same standard as used in the initial examination. The results obtained are shown in Table 3.

Table 3. *Results of hæmoglobin estimation after training.*

Hæmoglobin		Number of recruits
Per cent	Grams per cent	
Over 90	More than 13.3	73
80-89	11.8-13.2	52
70-79	10.4-11.7	16
60-69	8.9-10.3	2
50-59	7.4-8.8	0
40-49	5.9-7.3	0
Total		143

Difference in hæmoglobin concentration before and after training

The average hæmoglobin concentration of all recruits after training was 87.5 per cent. The striking difference in hæmoglobin concentrations before and after training is best shown by means of histograms (see Fig. 1 on page 117).

It will be noted that the average rise in hæmoglobin of all recruits was 10.8 per cent. As was to be expected, the greatest increase in hæmoglobin levels occurred in those recruits with low initial hæmoglobin concentrations. No recruit who initially had a hæmoglobin level of 80 (11.8 g.) per cent or less, finished the trial with a decreased hæmoglobin value. Table 4 shows the increases in each group.

Table 4. *Increase in hæmoglobin following training*

Group	Hæmoglobin level per cent	Number in group	Average increase per cent
1	40-49	5	36.2
2	50-59	13	30.5
3	60-69	25	22.6
4	70-79	33	14.9
5	80-89	34	7.3
6	Over 90	9	6.2

The hæmoglobin levels of two recruits in Group 5, remained unaltered and six others showed an average decrease of 5.7 per cent. In group 6, three recruits

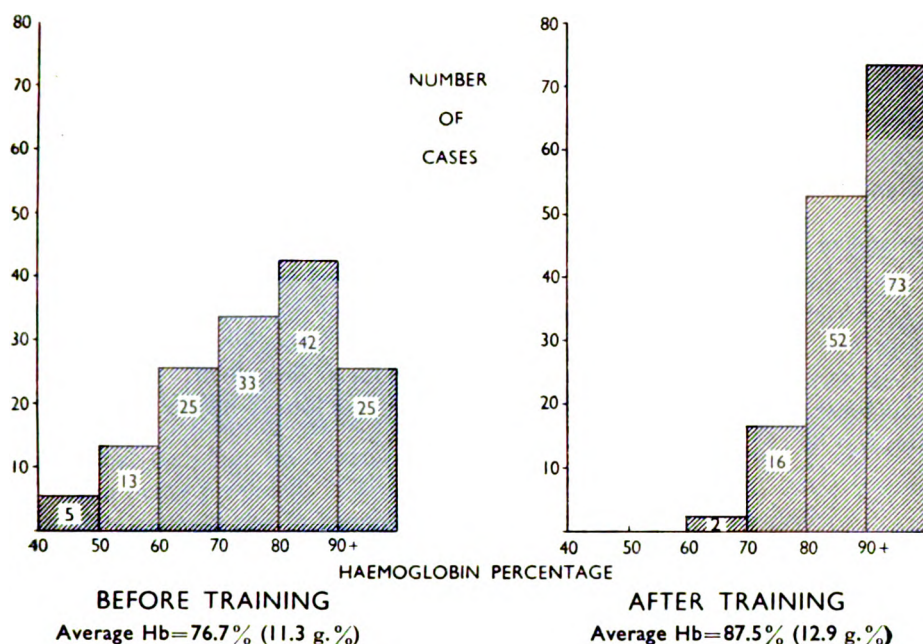


Fig. 1.

remained unchanged and thirteen others showed an average decrease of 6.5 per cent. It is felt that the gains and losses in haemoglobin concentration levels in Groups 5 and 6 fall within the bounds of experimental error with the methods used.

Peripheral eosinophilia and helminth infestation

An attempt was made to correlate the percentage of eosinophils found in the differential count with helminth infestation. It was found that though in general an eosinophilia did indicate helminth infestation, it was by no means an absolute rule, and some of the Malay recruits who had a triple infestation still had a very low eosinophil count. In addition it was found that the degree of eosinophilia bore no direct relationship to the type of worm infestation.

Ancylostomiasis and anaemia

As many of these Malay recruits on joining the service were found to be suffering from ancylostomiasis and some degree of anaemia, it was decided to try to estimate how far the ancylostomiasis could be incriminated in the production of their anaemia. Accordingly no treatment of any kind was given and the following results were obtained at the conclusion of their initial training.

Recruits with ancylostomiasis:

93 recruits showed an average rise of 15.6 per cent.

18 recruits showed an average fall of 5.95 per cent.

Recruits without ancylostomiasis:

- 30 recruits showed an average rise of 17.5 per cent.
- 2 recruits showed an average fall of 8.0 per cent.

Within the limits of the methods used and the results obtained, it is apparent that there is no significant statistical difference in the hæmoglobin rise in recruits with and without ancylostomiasis.

Hæmoglobin levels in trained Malay soldiers

An opportunity to confirm that a reasonable level of hæmoglobin is maintained in trained Malay soldiers was taken when 48 of these soldiers volunteered to join the blood transfusion donor panel. The hæmoglobin levels of these soldiers was estimated by the method previously described. The average hæmoglobin level was 93.1 (13.8 g.) per cent. The lowest hæmoglobin in this group was 85 (12.6 g.) per cent.

DISCUSSION

In view of the controversy regarding the part played by ancylostomiasis in the production of anæmia in the tropics it is interesting to note the marked improvement in the hæmoglobin levels of the recruits observed. This improvement was apparently produced entirely by an improved diet.

On enlistment the Malay recruit is given the normal Malay Army diet. This is on a generous scale and is considered to be considerably higher in protein value than the diet to which he is accustomed. The diet has a calorific value of approximately 3,300 calories daily, and contains a daily issue of fresh meat, poultry or fish. Eggs are also included in the diet with other protein-containing foods such as tinned milk, shrimp paste and soya bean sauce.

The results obtained in this survey do not entirely agree with results obtained by other workers. For example, Robertson (1957) states that there is no malaria, very little hookworm and no severe malnutrition in Singapore. While agreeing that malaria played no part in the anæmia observed in these recruits (no malarial parasites were found in the peripheral blood of the 143 recruits examined), the incidence of ancylostomiasis was astonishingly high (77.6 per cent). Also the improvement in the hæmoglobin levels produced by dietary changes alone suggests that there is some malnutrition present amongst the Malay population.

In our experience we find that Malay women, particularly when pregnant, also suffer from anæmia, sometimes very gross. Further work (as yet unpublished) has shown that these anæmias are not megaloblastic in origin. In the light of our findings with the recruits an attempt was made to treat these anæmias in pregnant Malay women by increasing their protein intake in the form of milk. Results obtained were disappointing and the anæmias did not improve to any marked degree. However, treatment with milk, iron and oral vitamins usually succeeded in raising the hæmoglobin to nearly normal levels. It should be added that the incidence of ancylostomiasis in the Malay women investigated was at least as high as that found in the recruits. This suggests

that anæmia due to malnutrition is fairly widespread amongst both Malay men and women. This anæmia appears to be due to a combined deficiency of protein, iron and vitamin B complex (all provided most adequately in the recruits' Army diet). It is therefore considered that the anæmias observed were due neither to ancylostomiasis nor a simple protein deficiency, and further, that ancylostomiasis as observed in Malaya is not the primary cause of anæmia though it may well be an aggravating factor.

SUMMARY

A total of 143 Malay recruits were examined for evidence of helminthiasis: 98 per cent of those examined were infested with ancylostomes, *Trichuris trichiura* or *Ascaris lumbricoides*. Many had a double or triple infestation. Ancylostomes were the most prevalent infestation (77.6 per cent).

The hæmoglobin levels of these Malay recruits were estimated before and after initial training, no treatment for their helminthiasis being given and no extra iron being provided. The recruits over the thirteen weeks' training period showed an average rise in hæmoglobin level of 10.8 (1.6 g.) per cent.

It is suggested that the increase in hæmoglobin level was due to the improved diet provided and not related to helminthiasis.

The rise in hæmoglobin levels observed was roughly proportional to the initial hæmoglobin level, i.e., the lower the initial hæmoglobin, the greater the rise in hæmoglobin level over the observed period of thirteen weeks.

No correlation was found between the incidence of helminthiasis and peripheral eosinophilia. A high eosinophilia was helpful in indicating the probable presence of helminths, but conversely a low peripheral eosinophilia did not exclude their presence.

Our thanks are due to Corporal I. C. Wilson and Privates T. R. Broomfield and D. Hay for their technical assistance.

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SOME CLINICAL FEATURES OF RINGWORM IN MALAYA AND HONG KONG

BY

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THERE are a number of features of ringworm of the glabrous skin as it affects our soldiers in the Far East which do not seem to be as widely recognised as they should be, largely because of deficient clinical as opposed to speculative study of the subject. There has also been a tendency to overlook known principles of cutaneous mycology and general pathology.

The material for this study was collected mostly in Hong Kong in 1953, because the seasonal incidence of the condition there emphasises certain features of the disease which are not so obvious in Malaya, where the "Hong Kong summer" type of weather persists the year round.

The meteorological conditions associated with a high incidence of body ringworm are a sustained relative humidity of over 80 per cent and a sustained temperature above 70° Fahrenheit. When these conditions obtain in Hong Kong the average wind speed is at its lowest. The obvious deduction from these facts is that increased sweating and decreased evaporation of sweat leads to water-logging of the horny layer, which is known to interfere with the normal self-disinfecting capacity of the skin. Unfortunately we have as yet no knowledge of what it is that makes the skin so resistant to superficial mycosis, and this most obvious line of research at present leads nowhere.

There is, however, evidence that the body recovers its powers of resistance, either naturally or as a result of infection. Clinically, relapsing ringworm is extremely uncommon, as are second attacks. If they do occur they tend to be limited in extent and activity. (This refers to the common body ringworm, of course, and excludes the occasional *Trichophyton rubrum* type of case.) The evidence rests on more than clinical impressions, and in this instance is based on the detailed anamnestic study of a random group of 153 soldiers who had spent at least two summers in Hong Kong and were returning to the United Kingdom on normal reversion to home establishment. It was found that 77 had suffered from body ringworm, of whom 71 were affected in their first summer, 6 in their second summer, and 8 had second attacks during their second summer in the colony.

In Malaya the great majority of attacks occur in the second to fourth month after arrival, and first attacks, relapses or second attacks are rare after six months have passed. For example, a recent series of 48 cases seen in Singapore and Kluang had an incidence of 85 per cent in the second to fourth month, and only one of the remainder had been in the country longer than seven months.

What are the sites of initial lesions and the distribution pattern of the

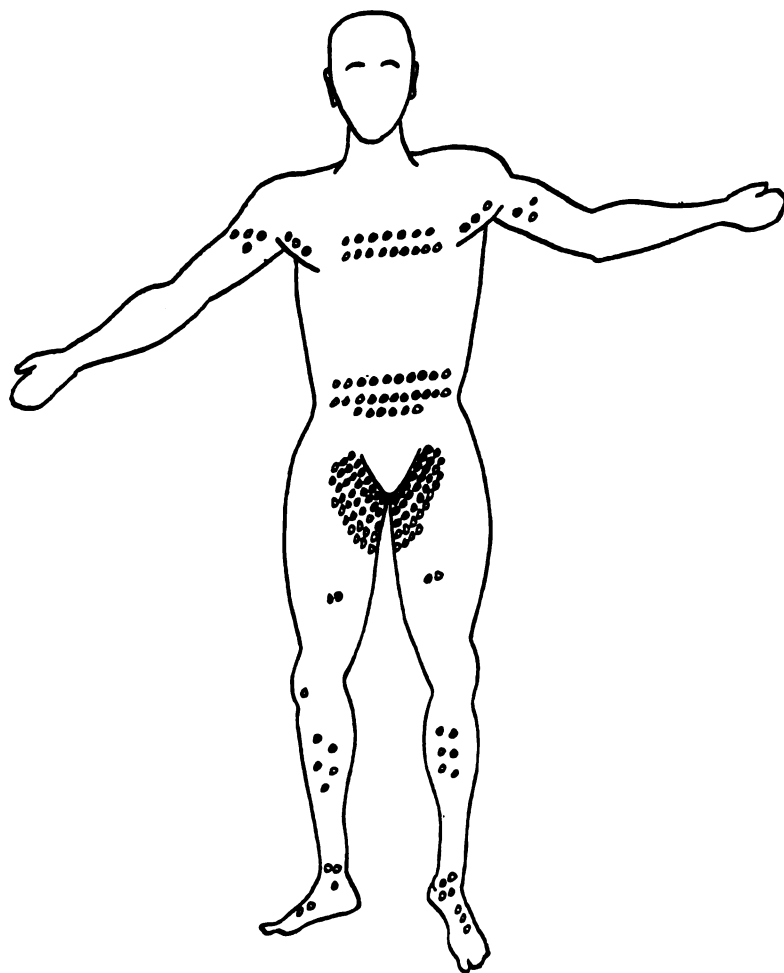


Fig. 1.—Composite diagram of sites (frequently multiple) affected in 85 random cases of body ringworm. Facial lesions occur, but not in this series. Solid dots indicate initial lesions, the site of which was uncertain in 5 cases.

developed case? In a random collection of 85 patients the initial sites were in the following order of frequency: crutch 41, waist 15, chest 9, stocking area 7, armpit 3, arm 3, thigh 2, uncertain 5.

The overall pattern of distribution is shown in the composite figure of "Mycotic Man" made by superimposing the 85 cases already mentioned (Fig. 1). The density of lesions not unexpectedly follows the pattern of initial development and immediately suggests a connection with clothing pressure and friction.

How much temporary disability is caused by this type of ringworm? The great majority of sufferers are not treated in hospital and it is very difficult to arrive at accurate figures. However, the cases so far discussed had treatment for

an average of nineteen days each, the extremes being three days and over ninety days.

In-patient figures are more accurate, and those from Hong Kong for a period of almost two and a half years show that when the disease is localised to one body area, 75 per cent are cured within thirty days, whereas if the condition is allowed to become generalised before admission, or if secondary complications arise, this figure drops to just over 50 per cent.

How much invaliding disability is caused? In Hong Kong, in the period just mentioned, 16 of the 373 patients who were treated in hospital for ringworm were invalided (4.5 per cent). They formed but a fifth of all the skin patients invalided in this time, and are not a very impressive number in a community with an attack rate of 50 per cent. More will be said about these 16 cases later.

In Singapore, between October, 1956 and February, 1958, only 2 of the 79 patients sent home with disabling skin disease had significant tinea. In each case it was a definitive type of tinea pedis, aggravated by other factors, and unrelated to any attacks of body ringworm.

What causes long-term disability and occasional invaliding in these cases? An attempt to clarify this point was made by studying in detail 74 consecutive in-patients in Hong Kong in 1953. It so happened that none had to be invalided, and 54 were returned to duty in less than thirty-two days, leaving a minority of 20 who were problems. Comparison between these two groups showed marked differences which were broadly related to inadequate treatment or management before admission on the one hand, and differences in host reaction on the other.

For example, half the difficult group of 20 had their ringworm for three to twelve weeks before admission, and were treated sporadically if at all. One patient had seborrhœic dermatitis in addition for four months, and another was sent by sea from Malaya to Hong Kong whilst suffering from active disease. Whilst in hospital 80 per cent of this group developed complications, as compared with 26 per cent of the majority group. Similarly 60 per cent developed fresh or recurrent ringworm lesions, compared with 17 per cent of the other group. Although analysis of the various complications shows that temporary eczematization of lesions, secondary infection, and non-specific crural dermatitis due to irritative factors including sweat retention are "normal" features of almost equal incidence in both groups, constitutionally or emotionally determined reactions such as seborrhœic dermatitis, excoriation and friction dermatitis, and avoidance of treatment are found preponderantly among those patients who spend more than a month in hospital (see Table 1). This point gains significance when seen alongside the real reason why most of the 16 invalided cases mentioned previously had to be boarded. Eleven of them developed seborrhœic or other eczematous complications, and once again the point is brought out that it is not the ringworm but the patient who has it that matters.

Is there any relationship between tinea pedis and the condition under review? It must be said straight away that the clinician dealing with hundreds of these cases is struck with the rarity of definitive fungus disease of the extremities either

before or after the attack. Abnormalities of the toe clefts are common, as they are in all British troops, but this is no more a specific disease than is otitis externa.

Table 1. *Complications in 74 cases of body ringworm treated in hospital*

A 54 patients in hospital less than 32 days			
B 20 patients in hospital more than 32 days			
(Percentages given in brackets)			
	A	B	
Seborrhœic dermatitis	2 (3.7)	6 (30)	
Crural dermatitis (non-specific)	4 (7.4)	2 (10)	
Pyogenic infection	4 (7.4)	1 (5)	
Local eczematization of lesions	4 (7.4)	2 (10)	
Excoriation	—	6 (30)	
Acute scrotal dermatitis (? cause)	—	1 (5)	
Axillary hidradenitis	—	2 (10)	
Avoidance of treatment	—	1 (5)	

The results of microscopy are of little use in trying to settle this problem unless carefully related to the clinical condition, at the same time bearing in mind the transient nature of contamination with most skin pathogens. One has only to consider for a moment the hypothetical position of regarding a streptococcus-positive throat swabs as being synonymous with significant streptococcal carriage or follicular tonsillitis, or conversely, of calling all sore throats streptococcal tonsillitis, to see by analogy how meaningless are most investigations of "tinea pedis."

The picture that emerges so far from this study is of a disease with a very high incidence but a very low long-term morbidity. The pathogen is obviously ubiquitous, but only gets a foothold when certain sustained conditions of environment combine with a lowered power of resistance in an individual on first exposure to these conditions. The distribution pattern of the lesions suggests strongly that clothing pressure and friction play an immediate part in initiating the disease, and leaves the possibility of actual contamination of clothing being an important source of infection as one that still cannot be too easily dismissed. An occasional patient seems to develop no resistance, or is found to have a *T. rubrum* type of disease, but the great majority of long-term effects are attributable to constitutional or psychocutaneous breakdown in which the ringworm has played an accidental part.

Until an effective antimycotic with antibiotic properties is discovered, or more is learnt about the natural defences against cutaneous mycosis, the mainstay of management will continue to consist in encouraging high unit morale, good hygiene, and insistence upon early complete treatment in all cases. In war, in jungle tropical conditions, widespread ringworm will remain an operational risk, but in normal conditions, units that are careful of their personnel in the first few months, and do not place them in positions where prompt effective treatment is impossible to carry out when ringworm first develops, will reap the benefit of their foresight in the long run.

Why does the treatment of established ringworm take so long in many cases? The answer is twofold. Firstly, the only effective fungicides are those preparations which cause desquamation in addition to any antifungal properties they

may possess. The only safe effective applications for routine use take five to seven days to achieve adequate peeling, and such an irritated area of skin needs ten to fourteen days in which to reconstitute itself. Secondly, sweating and clothing friction diminish the effectiveness of treatment, and this is almost impossible to avoid, not least in the bed patient, whose buttocks, crutch and thighs are constantly subject to such conditions.

Nothing has been said so far about suppurative ringworm, because this condition is a normal reaction to infection and the ultimate outlook is good. It has not been possible to estimate what proportion of cases develop this reaction, and the clinical impression during the past eight years is that the condition is becoming less frequent and less florid, which suggests that the local strains of *T. mentagrophytes* has now passed through so many human hosts that it is becoming more anthropophilic in its behaviour. The suppurative reaction usually develops during the second or third week of the disease—in other words, at the time when natural immunity develops—and eight to ten weeks pass before resolution is complete. If the impression is correct that suppurative ringworm is becoming less common, and for the reason suggested, then it follows that in general ringworm among our troops may become increasingly more indolent and difficult to cure as the fungus adapts itself to the hosts. This possibility has already been suggested by Lieut.-Colonel P. C. Mitchell (personal communications) and needs constantly to be borne in mind, for it is yet another cogent argument in favour of the principle of early complete treatment of the disease.

Finally, two points deserve to be mentioned. One is the rarity of dermatophytids among these patients. The second is to raise the question of the nature of the fine papular eruption that so commonly appears within healing sites in the third week. Is this a follicular mycid, a follicular recurrence, or due to sweat retention? Biopsies might give the answer and it would be satisfying to know.

SUMMARY

Body ringworm as it affects British service men in Malaya and Hong Kong is described as a condition that affects predominantly persons newly exposed to sustained conditions of high temperature and humidity.

Evidence is produced supporting the view that this abnormal susceptibility is short-lived and normal resistance soon returns.

The distribution of lesions follows a consistent pattern, being concentrated in areas of clothing tightness and friction.

Treatment is liable to be time-consuming unless early complete treatment is insisted on.

Chronic disease is rare, except in the small proportion of cases in which a constitutional or psychocutaneous breakdown is activated by the attack.

There is little to suggest that chronic definitive fungus disease of the extremities has any causal relationship to this type of body ringworm.

Attention is drawn to the rarity of dermatophytids in these cases, and the

question is raised as to the nature of a papular eruption frequently seen within healing patches in the third week.

The opinion is expressed that until an antibiotic effective against dermatophytes is discovered, or some understanding of the normal body defences against superficial mycosis is achieved, the mainstays of management of the problem will continue to be good unit morale and hygiene, and acceptance by all concerned of the principle of early complete treatment of every case.

My thanks are due to Lieut.-Colonel J. P. Baird, M.D., M.R.C.P., for helpful criticisms of this paper.

SCRUB TYPHUS IN THE DIFFERENTIAL DIAGNOSIS OF VENEREAL DISEASE

BY

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IN 1955, 106 infections of scrub typhus were diagnosed in military personnel in the Far East. An analysis of the signs and symptoms of 12 patients of this group showed that fever and chill were present in 9 patients, generalised lymphadenopathy in 11, rash in 5 and eschar with enlargement and tenderness of the regional lymph nodes in 3. Other constant findings were slow pulse and leucopenia.

In most cases the disease was contracted during operational or training duties in the jungle, and it is probable that in many instances the offending rickettsiæ gained entry to the body through the skin of the legs, thighs and genitals.

It is possible that an eschar of or near the genitals may be confused with venereal disease, particularly lymphogranuloma venereum, which includes in its symptomatology genital ulcer, painful enlargement of the inguinal lymph glands and high fever. Further, the broad spectrum antibiotics, the tetracyclines and chloramphenicol often used in the treatment of lymphogranuloma venereum are very effective against the rickettsiæ of scrub typhus. In view of this it is thought worthwhile recording the medical details of two soldiers referred to the Venereal Disease Department of the British Military Hospital, Singapore, as suffering from venereal disease. Both patients were eventually diagnosed as cases of scrub typhus and were successfully treated for this condition.

Case No. 1

A British soldier was evacuated from the jungle and admitted to the British Military Hospital, Kluang, on 14th March, 1956, complaining of a fever which had been present for twelve hours and an enlarged tender swelling of his right groin for four days. The previous history was irrelevant: his last admitted

sexual exposure was six months previously. As examination revealed the presence of a small ulcer, one half-inch in diameter, involving the skin of the right side of the scrotum, and a painful enlargement of a right inguinal lymph gland, he was transferred to the Venereal Disease Department of the British Military Hospital, Singapore, the next day as a case of venereal disease for investigation.

On examination the patient complained of pain in the right groin and abdomen. The temperature was 102° Fahrenheit, but the pulse rate was relatively slow, 65 beats per minute. A small infected ulcer about half an inch in diameter was present on the skin of the right side of the scrotum, and there was a large gland in the right inguinal region which was very painful and tender on palpation. The skin overlying the swelling was erythematous.

Laboratory Investigations.—The total leucocyte count was 2,600 per cu. mm. (neutrophils 46 per cent, lymphocytes 49 per cent, basophils 1 per cent, monocytes 4 per cent). The cells appeared normal. No malarial parasites were seen.

A clinical diagnosis of scrub typhus with an eschar of the scrotum was made. Blood was sent for Weil-Felix test and treatment with aureomycin was instituted, three grammes being given immediately, followed by half a gramme six-hourly.

The temperature became normal within forty-eight hours and remained so; the eschar healed rapidly and the glandular swelling subsided. The patient was found fit for duty on 26th March, 1956, only ten days after admission. Unfortunately the record of the result of the Weil-Felix test has been lost.

Case No. 2

A native soldier from Rhodesia was referred and admitted to the Venereal Disease Department of the British Military Hospital, Singapore, on 13th October, 1956, for treatment of a painful ulcer of the skin of the right inguinal region. He had recently been on operational duty in the jungle. There had been no sexual exposure since June, 1956, when he contracted a venereal sore of his prepuce for which he was treated with a combined course of streptomycin and sulphathiazole. At that time the Frei test and Wassermann reaction were negative.

Examination on admission revealed a sick patient with a temperature of 103° Fahrenheit. His pulse rate, however, was relatively slow (70 per minute). A small shallow ulcer of the skin was present in the left inguinal region immediately below the medial end of Poupart's ligament, a left inguinal lymph gland was enlarged and there was a generalised lymphadenopathy.

Laboratory Investigations.—The total leucocyte count was 4,500 per cu. mm. (neutrophils 61 per cent, lymphocytes 36 per cent and monocytes 3 per cent). The Wassermann reaction and Kahn test were negative.

A clinical diagnosis of scrub typhus with an eschar of the thigh was made; blood was sent for Weil-Felix test and treatment with chloramphenicol was started, three grammes on the first day followed by one gramme daily for five days. The response was dramatic. The patient became afebrile within twenty-four hours. The eschar healed rapidly and the lymph gland subsided in a few days. The result of the Weil-Felix test confirmed serologically a diagnosis of scrub typhus (see Table 1).

Table 1. *Readings of Weil-Felix test in Case 2*

Date	Titres at which agglutination obtained with suspensions of :		
	Proteus OX 2	Proteus OX 19	Proteus OXK
15 10 56	60	< 30	< 30
25 10 56	60	< 30	240
16 11 56	30	< 30	240

Note.—Titres are expressed as the reciprocals of the highest dilution of the patient's serum at which agglutination was observed.

The patient was seen again on 17th May, 1957, when he was fit and well. Blood taken for Wassermann reaction on that date was negative.

SUMMARY

Two cases of scrub typhus are described. In both, the existence of a genital eschar with regional adenitis pointed to venereal infection. Although only two cases have been recorded during the previous two years at the Venereal Disease Department of the British Military Hospital, Singapore, it is possible that others have been missed and it is considered that scrub typhus should enter into the differential diagnosis of certain types of genital ulcers, particularly those occurring in soldiers serving in areas where scrub typhus is endemic.

Thanks are due to Colonel R. J. G. Morrison, Consultant Physician, Far East Land Forces, for his encouragement.

A TRIAL OF METHODS FOR MASS INOCULATION

BY

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Royal Army Medical Corps

AND

Captain P. R. HOLT, M.B., B.S.(Lond.)

Royal Army Medical Corps

From The David Bruce Laboratories

PROVISION of a safe technique for mass inoculation has demanded much thought, particularly in the Army, as the possibility of the transfer of infection on a serious scale is well established. The ideal procedure to minimise this hazard is to provide a sterile syringe and needle for each inoculation, but this would in practice prove too costly and time consuming. It has been shown by Hughes

(1946) that when he removed the needle after intramuscular injection, red blood corpuscles could be demonstrated in the fluid in the syringe nozzle. Evans & Spooner (1950) demonstrated that when they injected a heavily infected animal and then removed the needle the residual fluid in the syringe became infected. These observers considered that the contamination was due to a negative pressure, induced by removal of the needle, causing fluid from the distal end to be sucked up into the syringe nozzle. This was confirmed by Fleming & Ogilvie (1951), and they proposed as a safe mass inoculation technique a modification of the hot-oil sterilisation method used by Sir Almroth Wright.

THE FLEMING AND OGILVIE TECHNIQUE

Liquid paraffin in a metal beaker supported by a metal retort stand is heated to a temperature of 130° to 140° C. by a bunsen burner. Sterilisation is effected by dipping the syringe in the oil to a level half-way up the needle mount for 10 seconds. The thumb must control the plunger during the injection, while the syringe is withdrawn from the patient and during sterilisation.

The hot-oil method of sterilisation has, according to Fleming & Ogilvie (1951), three main mechanisms :

- (a) The actual temperature of the oil.
- (b) The sterilising effect of the steam produced by the boiling of fluid inside the needle.
- (c) The mechanical effect of the jet of steam forcing out potentially infective material.

Experiments performed in these laboratories adhering strictly to this technique gave very satisfactory results. In fact, it was found possible using this method to give a large number (100) of injections into an infected "artificial mouse" as described by Evans & Spooner (1950), and still maintain the sterility of the syringe and needle when the pressure inside the "artificial mouse" had been raised by an additional 2.5 cm. of mercury, *i.e.* a pressure much greater than that likely to occur in the subcutaneous tissues of the body.

This technique was adopted by the Army in 1953 and has been thought to be both convenient and safe for mass inoculation procedures. There are, however, two disadvantages, not generally appreciated :

- (a) The syringe piston must be controlled firmly and continuously by holding the thumb or finger over the end of the plunger while injecting and thereafter. It has been observed that the majority of medical officers do not adhere to this technique, as it is uncomfortable and appreciable amounts of the inoculum tend to be discharged before or during the actual injection. Usually the injection is performed using the syringe as a "dart"—where the syringe is held by the thumb and forefinger from beneath the barrel, or as a "billiard cue"—where the syringe is held by the thumb, forefinger and the middle finger above the barrel.

- (b) The sterilisation in the hot oil must be performed by the operator himself, because he must not move his finger from the end of the plunger between completing the injection and the end of the immersion in hot oil. He therefore loses the advantage of team work when large-scale inoculations are required so that the time taken may be considerably increased.

This paper describes the results of experiments undertaken to assess whether modifications of this technique could be safely adopted to save time in mass inoculation.

METHOD

A syringe containing 0.2 ml. of sterile broth, drawn from a standard rubber-capped vaccine bottle, was used to inject into an "artificial mouse" filled with a broth culture of *Staphylococcus aureus* at a pressure, except where otherwise stated, of approximately 20 ml. of nutrient broth. Sterilisation was then carried out by immersion of the needle half-way up the butt in hot oil at 130° C. for 10 seconds with the thumb pressing firmly on the plunger. The sterility of the syringe was then checked by flushing 0.5 ml. broth from a second rubber-topped vaccine bottle into tubes of sterile broth and incubating at 37° C. for 48 hours. The sterility of the syringe and needle was tested before commencing each series of injections, and a check on the broth culture was made at the end of each experiment. The vaccine bottle containing the inoculum was also incubated for 48 hours. Usually 25 or 50 consecutive injections were made.

The standard 5 ml. all-glass syringe fitted with 1-inch needles (No. 23 S.W.G.) was used.

MODIFIED TECHNIQUES

In one series of experiments, the syringe was not sterilised immediately by the operator himself but was laid on the bench (thus interrupting the continuous pressure on the plunger), and then immediately sterilised in hot oil by the operator. The results showed that both the syringe and the vaccine bottle were invariably infected when tested after the first 25 injections. Repetition of this experiment, but examining the syringe for sterility after each injection, showed that the syringe was infected after a maximum of three injections.

A second series of experiments in which after each injection the syringe was handed, needle down, to an assistant for sterilisation showed that, although this was more effective, it was not safe and infection of 20 per cent of the tubes occurred. (It was evident that in this series infection was sporadic, and it is assumed that where the syringe was subsequently found to be sterile after having previously been contaminated, infection was minimal and overcome by dilution and the hot-oil treatment).

Subsequently, injections were made with the thumb not controlling the plunger during inoculation using the "billiard cue" technique described above, followed by sterilisation by the operator who firmly controlled the plunger. These experiments were first performed at pressures of 5 cm. of mercury,

but the syringe was heavily infected after the fourth injection, and even at atmospheric pressure 20 per cent of tubes were not sterile.

It was therefore realised that, especially in well-used and lubricated syringes, the plunger was not sufficiently stable to prevent small movements when not controlled by the thumb and when an assistant performed the sterilisation.

THE "SPRING CLIP" SYRINGE

It had been proposed that a metal spring clip which would grip the syringe piston firmly and thereby prevent reflux might obviate the inconvenience and delay involved in the operator having to maintain a constant firm pressure on the plunger after injection and during sterilisation. The experiments were repeated, using two syringes fitted with such a device. The results, however, proved disappointing, and it was clearly shown that the addition of the metal clip had no advantage over an ordinary syringe, and that any departure from the technique of Fleming & Ogilvie soon resulted in contamination of the syringe.

THE GROSS SYRINGE

In 1954 W. O. Gross (1954) described a syringe which seemed to offer a safe and rapid method for mass inoculation. The essential feature of this syringe is the design of the needle-to-syringe connection. The needle is attached by means of a flat plate fixed to its base which is pressed against a similarly shaped flat plate on the nozzle. In the course of removal of the needle these two flat surfaces are made to slide apart very rapidly. The needle can be removed without any suction whatsoever, thus eliminating the danger of reflux from the needle. A circular magazine to hold 50 needles is part of the apparatus, and changing of the needles can be effected with ease and rapidity.

In two series of experiments it was found possible to give up to 100 injections into an "artificial mouse," the internal pressure of which was as high as 6.4 cm. (2.5 in.) of mercury, and still maintain the sterility of the syringe when the plunger was firmly controlled during injection and withdrawal. When injections were given using the "billiard cue" technique, maintenance of sterility in several series of 25 injections was not possible when the pressure in the "artificial mouse" was at or above 1.3 cm. (0.5 in.) of mercury, although it proved effective on three occasions at atmospheric pressure.

CONCLUSION

The findings of Fleming & Ogilvie (1951) are confirmed and attention is drawn to the often neglected essential feature of this hot-oil sterilisation technique, namely that the thumb or finger *must control the plunger during injection, withdrawal and sterilisation.*

Several modifications of this technique were tried but resulted in contamination of the syringe.

A syringe incorporating a spring clip to stabilise the plunger and thus

obviate the necessity for the operator to maintain pressure on the plunger was found to be ineffective after repeated trials.

The syringe described by W. O. Gross (1954) seems to offer an advance in mass inoculation technique in that it provides a more rapid method than others described. Again, however, with this syringe the thumb must control the plunger carefully during injection and withdrawal from the patient. Whether such control with a syringe of this bulk is practicable will have to be determined in a series of field trials by regimental medical officers. In our hands it proved possible to use the syringe in this fashion, and it may well prove to be a step forward in the provision of a safe mass inoculation technique.

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SCHISTOSOMIASIS AMONGST RHODESIAN TROOPS

BY

J. F. AINSLIE, M.B., Ch.B

Rhodesia and Nyasaland Medical Corps

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THE marked increase in the incidence of schistosomiasis in Central and Southern Africa in recent years amongst all sections of the community is well known. Public Health authorities are faced with a formidable task when considering the preventive aspects of the disease on a nation-wide scale.

To approach the task by directing the attack mainly against the intermediate host, the snail, is inadequate because it would be impossible to cover all the rivers, streams and dams in such an immense area, although the value of these measures, however limited, cannot be disputed.

It would appear, then, that the maximum effort should be expended in dealing with the problem as it appears in the case of the definitive host, man. Here it is not sufficient to wait for symptoms to appear before dealing with them, but rather to look for evidence of the disease before it becomes clinically obvious. Under such circumstances treatment would be far more efficacious than when the lesions are well established.

This object was held in view by the writer when he was appointed in February, 1956, to be regimental medical officer to an infantry battalion of Rhodesian troops who were destined to do a tour of duty in the Far East commencing in April, 1956. The battalion consisted of 56 European officers and other ranks

and 856 Africans. The writer, unfortunately, joined the battalion only a short while before embarkation and was unable to carry out a survey before departure in order to discover how many were infected at that time. Enquiries, however, revealed that a survey had in fact been carried out in October and November the previous year on approximately three-quarters of the personnel who eventually accompanied the battalion to Malaya.

This survey involved the microscopical examination of the urine of all available personnel and 60 positive cases were found. All of these men were treated with nilodin, which was given by mouth in tablet form. Unfortunately no follow-up was done on any of these, but it was found that 30 presented again in Malaya with ova in their urine. The first of these was discovered two months after arrival and the last, sixteen months later. This does not speak well for the treatment used, but it appears that the men reacted unfavourably to it and difficulty was encountered in getting them to take the tablets.

Within five weeks of arrival in Malaya the first new case reported, and during the course of the ensuing twenty months cases continued to occur with increasing regularity. During the period under review 61 cases in all presented (including the 30 recurrences mentioned above), which represents 7 per cent of the personnel concerned. Of the 61 cases three were amongst the European personnel and 58 amongst the African. Of these, 12 presented within six months of leaving Rhodesia, an additional 19 within twelve months and a further 30 within twenty months. The insidious onset of the disease must be adequately appreciated, and it is remarkable to note that all these seemingly healthy men were undoubtedly carriers of this unpleasant condition and had been in some cases for quite a considerable period. The inference is that all these men would have been potential infectors of others had they remained in Rhodesia.

Manson-Bahr (1954) makes it clear that patients may go for as long as two and a half years from the time of infection until they have symptoms and this series of cases supports that view. Because of the mildness of the initial symptoms, these may easily be ignored by the patient unless he is specifically asked about them ; thus the two-and-a-half-year period may be considerably exceeded before the symptoms become severe enough for his own attention to be drawn to them, and his potential as a carrier is therefore increased accordingly.

All these cases presented with very vague symptoms ; in none was the diagnosis obvious and it was made only as a result of repeated urinary investigations ; in some it was necessary to resort to cystoscopy. A mild dysuria was the most common symptom, marked hæmaturia was never seen. All cases, however improbable, were subjected to careful urine examination and the number of positive findings was very gratifying. Fifty of the cases were diagnosed microscopically and 11 by cystoscopy. All proved to be cases of *Schistosoma hæmoglobinum*; neither *S. mansoni* nor *S. japonicum* was seen.

Nothing but microscopical evidence was regarded as diagnostic in any of these cases, and if there was any doubt, cystoscopy was done and in very few suspected cases was this found to be negative. Cases which had recently been subjected to vigorous operational activity or physical training were invariably

positive, which bears out the observation so frequently made that all suspected cases should be exercised prior to their urine being examined. The simple microscopical examination of a centrifuged specimen of urine proved to be the most successful procedure, as a large number of such examinations can rapidly be undertaken by a properly trained technician. In this series this was done by a specially trained African orderly, and he proved to be quite uncanny in his ability to demonstrate ova in the urines he examined.

When the battalion left Rhodesia it was considered to be at the peak of physical fitness as a result of selection, training and medical examination. In Malaya, it was understood that suitable snails for transmitting the disease were not found; thus the possibility of new cases developing or old ones becoming reinfected did not exist. Work by Sandosham (1956) has shown, however, that species of snails similar to those found in Rhodesia, *e.g.* *Bulinus* and *Lymnaea*, exist in Malaya, but attempts to transmit schistosomiasis with these local snails were not successful. Previous experiments carried out by workers in Egypt and India along similar lines had also failed. It was felt, however, that if enough ova were set free in Malaya over a sufficiently long period, then there might be danger of mutation to a strain capable of establishing itself in local snails. Past experience has shown that this has occurred in America where ova had been brought in by negro slaves and in Australia, after World War I, where the ova were introduced by troops returning from endemic areas. The risk in Malaya might be entirely a function of time and weight of attack, and it was thought that neither of these criteria had as yet been fulfilled.

With regard to treatment it was found that intravenous sodium antimony tartrate (S.A.T.) was superior to all other forms tried. Although unpleasant side-reactions, for which this drug is well known, occurred, there were no cases of recurrence in the 30 cases where it was used in treatment. Intramuscular stibophen, nilodin and anthiomaline were also tried, particularly in those cases which had reacted unfavourably to S.A.T. In the 31 cases so treated there were 10 recurrences. As far as possible all cases were followed up after their return to duty from hospital; their urines were examined fortnightly for three months, starting one month after discharge. A total of 1,294 days were spent by these 61 men in hospital (average 21 days per man). This represents a minimum loss to the Governments of £776 in pay and rations.

As a result of this survey it is reasonable to assume that other battalions must be similarly affected and that in the armed forces alone the country has a considerable reservoir of infection. This is important in view of the highly mobile role these men are called upon to play during the course of their military duties in all parts of the Central African Federation, with resulting further dissemination of ova into the various rivers and streams.

This spread of infection could be prevented provided all members of the forces were subjected to urine examination at regular intervals and all positive cases treated. If such a system were introduced in the armed forces it should be possible to extend it to cover civilian organisations as well. It is appreciated that it would be a tedious and difficult undertaking, but in the absence of any

other practicable alternative, and because schistosomiasis is becoming as big a menace as tuberculosis, a concentrated effort to combat it is justified.

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SEVEN NEW SALMONELLA SEROTYPES

*A Report from The David Bruce Laboratories, East Everleigh, Wiltshire*¹

DURING an extensive survey of faeces from West African lizards carried out in 1956 (Vella, 1958), seven new salmonella serotypes were isolated. These are now included in the 1958 Schema (with the exception of the monophasic variant of *Salmonella canastel*).

The new serotypes are :

<i>Salm. legon</i>	...	...	...	4,12 :	c	: 1,5
<i>Salm. tamale</i>	...	...	...	(8),20 :	z ₂₉	: —
<i>Salm. canastel</i> var. monophasic	...	...	...	9,12 :	z ₂₉	: —
<i>Salm. akuafo</i>	...	...	...	16 :	y	: 1,6
<i>Salm. ghana</i>	...	...	...	21 :	b	: 1,6
<i>Salm. kokomlemle</i>	...	...	...	39 :	1,v	: e,n,x
<i>Salm. teshie</i>	...	...	...	47 :	1,z ₁₃ ,z ₂₈	: e,n,z ₁₈ ²

These new serotypes were all motile and possessed the biochemical characteristics of the salmonella group. They fermented glucose, maltose, mannitol, sorbitol, dulcitol, arabinose, rhamnose, trehalose and xylose promptly with the production of acid and gas. They failed to ferment lactose, sucrose, salicin, adonitol and raffinose. The only biochemical variation found was that while *Salm. tamale*, *Salm. canastel* var. monophasic and *Salm. kokomlemle* fermented inositol with production of acid and gas, the other strains failed to do so. They all gave positive methyl red and negative Voges-Proskauer reactions, did not produce indole, hydrolyse urea, grow in KCN broth or liquefy gelatin. They grew readily in Koser's citrate medium and on Simmons citrate agar, produced H₂S, and reduced nitrate to nitrite. Tests with salts of organic acids (d-tartrate, mucate and citrate) and Stern's glycerol fuchsin broth were positive. Phenyl pyruvic acid and malonate tests were negative.

SEROLOGY

In each case the somatic and flagellar antigens were determined by the use of diagnostic sera in routine use. Rabbit sera, "O" and "H," were prepared from

¹ Those responsible were : Colonel M. H. P. Sayers, Majors M. M. Munro and R. C. Stewart, Sergeant I. G. Hopkins, Corporals K. B. Easterbrook and D. J. Maddox, all of the Royal Army Medical Corps ; and Mr. A. E. Vincent, A.I.M.L.T.

² The final identification of *Salm. teshie* was carried out by Dr. Joan Taylor, but it is included here at her request.

each organism and these were tested against known salmonella serotypes with the appropriate homologous antigens. Mirror absorptions were then carried out and the results confirmed the antigenic structures given above.

SUMMARY

Seven new salmonella serotypes, isolated from West African lizards, are described.

Grateful acknowledgement is made to Dr. Joan Taylor of the Salmonella Reference Laboratory, Colindale, and Dr. F. Kauffmann of the International Salmonella & Escherichia Center, Denmark, who confirmed the findings reported here.

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A HAZARDOUS ANÆSTHETIC

Captain C. M. CAMPBELL, M.B., B.Chir., D.A.

Royal Army Medical Corps

Anæsthetist, B.M.H., Iserlohn

THIS case is not presented because it is in any way original or unusual, but to emphasise an anæsthetic emergency that is described in many text-books and to show how quickly troubles can arise.

A young man of 22 years was admitted to this hospital with fractures of the cranial vault and base and also a fractured mandible. There was extreme cerebral irritation but no evidence of compression. A few days later his general condition was much improved and it was decided to fix the loose fragment of the mandible. As the patient had no teeth a splint had to be made from his dentures, and under general anæsthesia this splint was fixed to the mandible by wires passing round the body of the bone (circumferential wiring) and the upper and lower jaws were wired together. On this occasion anæsthesia was uneventful ; when he awoke the patient was more comfortable than he had been, he could speak and take food more easily, and radiographs showed that the loose fragment was in good position.

Unfortunately some infection occurred when the circumferential wiring was done. Four days later the patient was very ill ; he had severe bilateral submandibular cellulitis spreading down into the neck (Ludwig's angina), and this clearly needed incision and drainage. At the same time he was very toxic and his mental condition had deteriorated so that he was delirious. He was a strong man and needed two or three attendants all the time to control him.

It was clear that general anæsthesia would be necessary to allow adequate surgical treatment and this was a classical case of a hazardous anæsthetic as described in the text-books under the heading *Anæsthetic Emergencies*. In Ludwig's angina there is always some associated œdema of the larynx and there

is great danger that anæsthesia may in such circumstances produce complete laryngeal obstruction to respiration.

Atropine gr. 1/100 was given to the patient as premedication, and an hour later he was brought to the operating theatre with three attendants to keep him on the trolley. At this stage his respiration did not seem obstructed at all although there was a small quantity of pus in his mouth from the submandibular infection. A sterile tracheotomy set was open and ready for immediate use.

The patient was transferred to the operating table with some difficulty and pure oxygen was given through a mask for about three minutes ; after this cyclopropane was gradually added to the mixture until a concentration of 33 per cent was reached. Anæsthesia was now deep enough to allow an incision to be made in the submandibular region on each side ; at this time the respiration was very slightly obstructed, but not sufficiently to cause any alarm. Pus came out through lateral incisions and drains were inserted.

While the stitches were being inserted to keep the drains in position the patient's respiration suddenly became completely obstructed. Muscular efforts to overcome the obstruction were slight and quite ineffective and very soon ceased entirely. The patient's colour became blue very quickly and it was not possible to force any oxygen into his lungs by means of pressure on the re-breathing bag of the anæsthetic machine.

At this point tracheotomy was clearly essential and as the set was ready and to hand this was quickly done. The stimulus of this procedure was sufficient to restart respiratory movement and artificial respiration was not needed. The patient's colour rapidly returned to normal and the operation was completed uneventfully.

The young man's condition steadily improved from that time. His wires were removed a few days later to help overcome his infection, and shortly after that his tracheotomy was closed. He was later evacuated to the United Kingdom for further treatment.

Calley (1954) states that the essential points in cases of Ludwig's angina are :

- (1) Avoid intravenous anæsthetics, especially pentothal.
- (2) Always have a tracheotomy set ready.

The reason why pentothal is so frequently fatal in these cases is not definitely established. It is known that this drug increases laryngeal irritability and it seems likely that its depressant action upon the respiratory and cardio-vascular centres is enhanced in Ludwig's angina. Calley suggests that this may be connected with increased sensitivity of the nerve endings in the carotid body. The point about the tracheotomy set is well illustrated by this case.

I am grateful to Lieut.-Colonel J. Thompson, M.C., F.R.C.S., R.A.M.C., and to Lieut.-Colonel E. Stanhope, M.B.E., R.A.D.C., for encouragement in writing this paper.

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Correspondence

From Colonel D. Wright, D.S.O., O.B.E., M.B., F.R.C.S., late Royal Army Medical Corps

DANGERS OF THE ENEMA

SIR,

The enema has probably been one of the most popular therapeutic measures in medical practice throughout history and has been used more indiscriminately by doctors, medicine-men and Spa-owners than any other known agent with the possible exceptions of hot sweet tea and brandy.

Only since the early 50's of this century has attention been focused on the dangers of this apparently innocuous ritual. This has been done mainly by the pædiatricians who have drawn attention to a syndrome of water intoxication occurring in infants who had retained large or repeated enemata and then developed symptoms of cerebral upset with drowsiness and weakness, perhaps followed by convulsions, and in a number of cases by coma and death. Much the same has occurred in constipated gynæcological cases and in paraplegics. Apart from this well-defined syndrome all sorts of accidents have occurred from enthusiasm, carelessness, inexact anatomical knowledge, and as a result of trauma to diseased bowel wall.

In 1953 A/B Mc——, aged 19, fell through an open hatch into the hold of his ship, fracturing his lumbar spine and damaging his cauda equina. In hospital he was nursed on a Stryker Frame, and was doing well, impressing everyone as a co-operative, stoical and likeable young man, until one morning he startled the ward by singing bothy ballads, using strong language, and then becoming quite violent and difficult to control. At this stage he was hot and flushed, but in about twenty minutes this subsided and he became pale, sweating and collapsed. This continued until he was comatose and in marked peripheral vascular failure with a thready and almost imperceptible pulse. All examinations failed to explain his condition and, as a last despairing gesture, a blood transfusion was started.

Almost at once an improvement was noticed and the circulation recovered while the boy gradually regained consciousness. In about three hours he was completely recovered apart from a splitting headache which lasted well into the evening.

The case was considered by all the experts and was the subject of a clinico-pathological conference without the mystery being solved until the sister in charge of the ward found that her stock of Spirit of Green Soap (USP) had disappeared. Further enquiry showed that a new orderly who had been told to give A/B Mc—— a soap enema had poured the lot, some sixteen ounces, into the poor fellow and had been calmly awaiting results when the mysterious illness started.

Before his accident the sailor had been a teetotaller and it was felt that he might have had his principles strengthened whatever other benefit he had from his treatment in hospital.

Headquarters, Second Division,
British Forces Post Office 22

I am, etc.
DAVID WRIGHT.

MUNIMENT ROOM AT THE ROYAL ARMY MEDICAL COLLEGE

A descriptive catalogue of the various historic documents, books, manuscripts, etc., housed in the Muniment Room at the Royal Army Medical College has now been completed.

Major-General R. E. Barnsley will be pleased to forward a copy to anyone interested on application to him addressed as follows: The Hon. Secretary and Curator, R.A.M.C. Historical Museum, Queen Elizabeth Barracks, Crookham, Hants.

BRITISH RED CROSS SOCIETY

TRAINING IN FIRST AID

The British Red Cross Society has increasing commitments to provide training in First Aid for its own members, for the National Hospital Service Reserve, the Civil Defence Corps, Industry, Agricultural Workers and the General Public.

First Aid classes are arranged by local branches of the Society in all parts of the United Kingdom throughout the year, mainly in the evenings once a week. The Society would welcome the help of any serving or retired officers of the R.A.M.C., who are willing to act as lecturers and examiners.

Intensive residential First Aid courses lasting one week are also arranged twice a year, usually in September and January, at the B.R.C.S. National Training Centre at Barnett Hill, Woneresh, near Guildford, Surrey. Offers of help from any retired R.A.M.C. officer or other retired doctor, who would be willing to spend a week at the training centre as resident lecturer for these courses would be most gratefully received.

Officers who could give assistance with either of the two types of course mentioned above are asked to get in touch with the Medical Adviser to the British Red Cross Society, Major-General F. C. Hilton-Sergeant, C.B., C.B.E., 7, Grosvenor Crescent, London, S.E.1.

GEORGE KNIGHT CLOWES MEMORIAL PRIZE ESSAY COMPETITION, 1960

Prizes: First prize, £35; Second prize, £15.

Closing date: 31st March, 1960.

Subject: Since 1945 drastic changes have taken place in Britain's military commitments, and in the likely pattern of a future war.

What, in your opinion, should be the future role of the Territorial Army in these new conditions?

Give your views on how it should be organised, equipped and trained to fulfil the role, or roles, you suggest.

General conditions for this essay competition will be the same as for the 1959 competition and can be found in A.C.I. 350 of 1958.

GOLD MEDAL AND TRENCH GASCOIGNE PRIZE ESSAY COMPETITION, 1959

Prize: Thirty guineas and Gold Medal.

Closing date: 16th November, 1959.

Subject: NATO was established in order to secure Europe against Soviet aggression; so far this has been achieved. Soviet aggression is, however, taking place beyond the boundaries of NATO. Can this best be halted by extending the sphere of influence of NATO or is there a need for some global organisation to embrace existing alliances such as NATO, SEATO and the Baghdad Pact?

OR

Seapower will be vital for the Western Alliance in any future all-out contest between East and West (Field-Marshal Montgomery). Discuss this in the light of the Communist threat.

General conditions for this essay competition are contained in A.C.I. 82/1959.

Book Reviews

COLD INJURY—GROUND TYPE (Medical Dept. U.S. Army in World War II). Colonel Tom F. Payne, M.C., U.S.A. (Ret.), and Michael E. DeBakey, M.D. Washington, U.S.A. : Office of The Surgeon General of the Army. 1958. Pp. 570+xxi. Illustrated. 44s.

Cold injury can occur in any army at any time, often when least expected and sometimes under conditions that are apparently insufficiently cold to cause injury. Therefore, it is most important that all concerned with the management and care of personnel in the field should be aware of this condition and of its importance. Cold injury is a preventable disability and if allowed to occur can be most prodigal of manpower.

This American publication from the Medical Department, United States Army, deals with the subject extensively and intensively. It traces the history of the condition and does not hesitate to direct attention to the devastation caused by cold injury among American troops in various theatres of war in World War II. It also discusses the means undertaken to prevent such injuries and it deals with the clinical aspects of the problem very thoroughly.

To most who are concerned with the care of military personnel in the field the essential information about cold injury is obtainable in the smaller handbooks, but this publication is a complete review of the whole problem which military medical personnel will find rewarding to read.

A. G. D. W.

TEXTBOOK OF SURGERY. With a Foreword by Sir Russell Brock, M.S., F.R.C.S. Edited by Guy Blackburn, M.B.E., M.Chir., F.R.C.S., and Rex Lawrie, M.S., F.R.C.S., M.D., M.R.C.P. Oxford : Blackwell Scientific Publications. 1958. Pp. 1,122+xii. Illustrated. 84s.

The task of including the whole of general surgery in a book of one volume is a formidable one. This is the more so when orthopædics, fractures, anæsthesia, radiology and radiotherapy are also included. The authors have attempted this task with a view to providing the undergraduate with a modern textbook of surgery.

The Army surgical specialist has need of a textbook of surgery for two purposes, firstly as a reference book to refresh his memory in the details of surgical operations, and secondly as a source of recent and up-to-date information on the newer aspects of surgery. This does not attempt to be a textbook of operative surgery, and is therefore of little help to the practising surgeon in describing how to perform a particular operation. It is, however, a most valuable source of information on the topics in which recent advances have been made, and in this respect I should pick out the chapters on heart and lungs, on the œsophagus, on the adrenal glands and on fluid and electrolyte balance. As I read other chapters I was struck by the clarity of the descriptions, the excellent diagrams and the new approach to many of the long-standing surgical problems such as the management of intestinal obstruction and breast cancer.

While the whole is under dual authorship, various chapters are written by specialists who from their own experience and original work are qualified to be

regarded as experts. The fact that all are on the staff of Guy's Hospital means that the whole book has the common background of one teaching hospital, and therefore expresses opinions which in the main conform. This is important for the undergraduate student.

To sum up, this textbook is easy to read, is clear and concise in its exposition, and is beautifully illustrated and produced. Its object in providing a comprehensive survey of surgery is admirably achieved. The price is very reasonable. It is strongly recommended for any medical officer who wants to have with him a modern textbook for reference.

R. E. W.

EMERGENCY SURGERY (7th Edition). Hamilton Bailey, F.R.C.S. Bristol : John Wright & Sons Ltd. 1958. Pp. 1,213 + xvi. Illustrated. £9 9s.

The good reputation of this book is well established, and the appearance of a new and seventh edition speaks for itself. It is thoroughly revised, with more attention to diagnosis but with emphasis still on treatment.

Not every surgeon of experience will agree with everything in it, but the young surgeon, who finds himself face to face with any of the emergencies discussed, will not stray far from the correct path if he follows the recommended managements till such time as more experienced advice is available. After all it is a textbook of emergency surgery.

The cover states that the book is supplied to all seagoing ships of Her Majesty's Navy. By the same token it should be available to every Army medical establishment likely to undertake emergency surgery. Moreover it should be in all medical libraries, and may well find a place on the book-shelves of every practising surgeon, in spite of its cost of nine guineas. However, book illustration is expensive, and this has pictures in abundance.

A. G. D. W.

THE SICK AFRICAN (3rd Edition). Michael Gelfand, O.B.E., M.D. (Cape Town), F.R.C.P., D.P.H., D.M.R. Cape Town : Junta & Co. (London : H. K. Lewis & Co.). 1957. Pp. 866 + viii. Illustrated. £4.

The publication of the third edition of Dr. Gelfand's book is proof, if proof were needed, of the important place it has come to fill in the literature of tropical medicine, a place it would seem destined to fill for many years to come.

The author writes clearly and authoritatively as the result of a vast experience, and although there are indeed full accounts of the clinical aspects and treatment of all the commoner diseases affecting the African, he does not pretend to write a textbook as such, and in fact a great deal of the value of the book would be lost were it to be so considered. Rather does he write to show us how the effects of disease in the African are influenced and sometimes distorted by a tribal, cultural and spiritual background so vastly different from that of the European. He stresses the importance of a new outlook for the doctor accustomed only to European medicine when dealing with the African. Multiple pathologies are the rule rather than the exception ; ignorance and superstition will confound the most scientific treatment unless not only the disease itself but also the patient as a total being in his special environment is considered, and whatever good may

have been achieved under hospital conditions will be quickly nullified on return to that environment if it should be inadequate.

Education, a higher standard of living both nutritionally and hygienically, as well as economically, and eradication of superstitious fears are all essentials to be kept in mind by those planning the future health of Africa. While this book has been written with a deep understanding of the African, and the task would surely never have been undertaken if there had not been affection in this understanding, the lessons we may learn from it are not only applicable to Africa, but to all those areas of the world where disease is rife and life is poor. In such areas an understanding of the patient, his background, his thoughts, and his fears are even more important than in the European, and often more difficult for us to achieve with our different upbringing and frequent ignorance of the language. The book is inspired by that simple, practical and human approach inherent in all good medicine, and is a source of pleasure, as well as education, to the reader.

J. A. G. C.

A SYNOPSIS OF SURGERY (HEY GROVES) (15th Edition). Edited by Sir Cecil P. G. Wakeley, Bt., K.B.E., C.B., D.Sc., F.R.C.S. Bristol : John Wright & Sons. 1958. Pp. 658+viii. Illustrated. 37s. 6d.

A surgical epitome that has appeared in fifteen editions since it was first written by the late Sir Ernest Hey Groves fifty years ago obviously meets a continued demand with success. Textbooks of surgery increase in number and girth ; their reading takes time and absorption of their knowledge more time. Revision of their scope may be a pious hope deferred. To examination candidates so placed this small book may bring hope or relief.

The present edition has up-to-date, though naturally brief, notes on recent advances. It would seem impossible further to compress with any degree of efficiency the range of surgical information it contains.

Minor criticisms are that the sections on burns, gunshot wounds, sterilisation of materials and on antibiotics are less accurate than the main body of the work. There are some dogmatic statements that would bear discussion, such as in the treatment of recurrent dislocation of the shoulder, where Bankart's operation is stated to give the best results and the Nicola operation is outlined but no mention is made of the Putti-Platt, an efficacious and popular procedure. These are minor criticisms showing that the Synopsis has been read ! The order and classifications, lay-out and type, line illustrations and index are admirable.

Within its compass, as a concise handbook for speedy reference or for the revision of previously acquired surgical knowledge, the Synopsis maintains its position.

J. H.

INTERNATIONAL STANDARDS FOR DRINKING WATER. Geneva : World Health Organisation. 1958. Pp. 152. £1.

This book has been compiled by a study group of experts "with the aim of stimulating further investigation of the problem" of water quality and inviting "critical observations."

The first part of the book deals with the sampling of water, standards of purity and the methods used in the bacteriological, chemical, radiological and biological examination. The second part gives approved, but not standard, methods of examination in great detail.

There is also a list of suggested subjects for research, a table of contents but no index for the whole book, and it ends with a list of twenty-nine references.

The book has a bias towards American methods and apparatus. For example, on page 22, the use of five 10 ml. portions of water is recommended for the presumptive *E. coli* test instead of the volumes advised in British practice (Reports on Public Health and Medical Subjects No. 71. Ministries of Health, Housing and Local Government). Storage of samples for a bacteriological examination to a maximum of twenty-four hours (page 18) is allowable instead of our six hours.

American apparatus is also recommended, as on page 133, W.S. standard sieves are advised with no mention of the equivalent B.S.S. sieves used in this and many other countries.

These things rather detract from its value in Great Britain and it is hoped that in future editions, British standard practice will be given a larger share.

S. E.

PERIPHERAL NERVE INJURIES. Ruth E. M. Bowden, D.Sc., M.B. London : H. K. Lewis & Co. Ltd. 1958. Pp. 62+viii. Illustrated. 8s. 6d.

The author is an anatomist who has had extensive experience of the treatment of peripheral nerve injuries in a special centre. She has produced an excellent little book setting out very clearly the elements of the diagnosis and the principles of modern treatment.

Written particularly for physiotherapists, medical students, and housemen, it is recommended in the Army for all young medical officers. Sister tutors should find it valuable in preparing their lectures.

P. R. W.

AIDS TO MALE GENITO-URINARY NURSING. J. Sayer, M.B.E., S.R.N., D.N. London : Baillière, Tindall & Cox. 1958. Pp. 171+xii. Illustrated. 8s. 6d.

This is a useful little reference book, especially for the male nursing student, who has a need for a book devoted to this branch of nursing, as many general textbooks do not afford it sufficient space. Sections on special procedures, investigations and tests are particularly useful, and the anatomy of the male genito-urinary system is well described.

More attention might have been given to post-operative care and complications. Particulars of instructions to patients on leaving hospital would also have been useful.

In the light of the considerable recent advances in genito-urinary surgery and therapy, this third edition has maintained its conciseness and balance and should prove useful to nurses in many lands.

V. M. I.

THE EXTRA PHARMACOPŒIA, VOL. I (Martindale). London: The Pharmacopœia Press. 1958. Pp. 1,695+xxx. £3 5s.

The 24th edition of "The Extra Pharmacopœia," Volume I, is one of the most useful and instructive books a doctor could possess. It is a complete guide to the various drugs, both proprietary and otherwise, used in modern medicine and in addition gives most useful details of treatment, and the results of over-dosage. It is completely up to date, most surprising in a book of this size, and a great boon in these days when drugs have so many different names. R. A. B.

A CLINICAL INTRODUCTION TO HEART DISEASE. Crichton Bramwell, M.A., M.D., F.R.C.P. Oxford: Oxford University Press. 1959. Pp. 229. Illustrated. £1 1s.

This book is written in beautiful English by an author who is not afraid to use the first person singular. It is consequently one of the most readable medical books that has been published since Sir Robert Hutchison's *Lectures on Diseases of Children*.

Taking the heart in health and disease as his theme, Professor Crichton Bramwell contrives, in just over 200 pages, to illuminate most branches of medicine, including surgery and obstetrics, and also to demonstrate the art of being a consultant physician. He does this partly by delightful comments and asides in the body of his text and partly by the inclusion of 36 illustrative case histories, which maintain the standard set by his illustrious father.

Professor Bramwell declares that his book is addressed to students and general practitioners, but, as it contains the distilled wisdom of a master of his craft, no doctor will read it without interest and profit.

The book is beautifully produced by the Oxford University Press and costs the modest sum of one guinea. It is cheap at the price. R. M. J.

BRITISH RED CROSS SOCIETY MENTAL HEALTH MANUAL. David Stafford-Clarke, M.D., F.R.C.P., D.P.M. London: B.R.C.S. 1958. Pp. 85+viii. Illustrated. 3s.

This excellent little book accomplishes very adequately what it set out to do—*i.e.* convey in simple and lucid terms the essentials of a first aid and nursing approach to all types of illness in which psychological disturbance plays an important part.

The chapter on psychological first aid following major disaster is especially good, and in general one can say that the 86 pages of clear, easily read typescript are the best value for the modest sum of three shillings one is likely to obtain these days.

Much of what it contains is applicable to military as well as civilian situations, and even the ten pages on the Unconscious Mind could well be studied by all who wish to understand their patients better. R. P.

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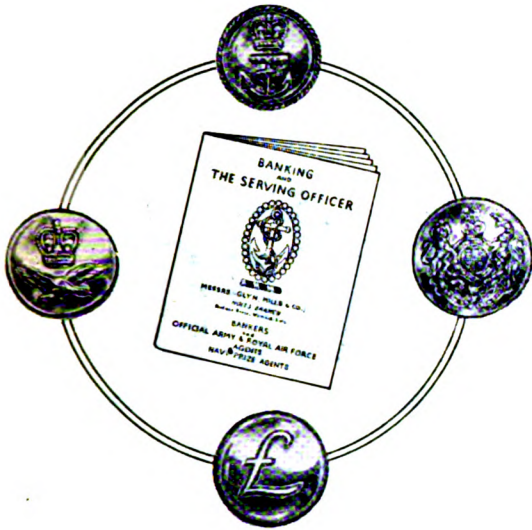
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CONTENTS

CLINICAL COMMUNICATIONS

	PAGE
The Army Medical Services. By Major L. L. Gordon	145
The Health Lessons of Cyprus, 1955-58. By Lieut.-Colonel F. G. Neild, M.R.C.S., D.P.H., D.I.H., R.A.M.C.	152
Geriatrics in the Army—Report of a Case. By Dr. P. B. Adamson, M.D. (Lond.)	159
An Outbreak of Bacillary Dysentery in an Isolated Army Establishment. By Captain J. D. Leece, M.B., Ch.B., R.A.M.C.	164
Salmonella Paratyphi BO Agglutinin Levels in Paratyphoid B Fevers. By J. F. Watkins, M.B., B.Chir., Dip. Bact.	167

	PAGE
Physiological Problems of the Soldier in Tropical Warfare—An Operational Approach. By E. T. Renbourn, M.D., M.R.C.P., B.Sc.	172
The Incidence of Abnormalities of the Toe Clefts among British Troops in Malaya. By Lieut.-Colonel F. J. Ingham, B.M., B.Ch., D.P.H., and Major T. A. G. Reed, M.B., B.S., R.A.M.C.	182
EDITORIAL	187
BOOK REVIEWS	189
NOTICE TO SUBSCRIBERS	191
EDITORIAL NOTICES	192

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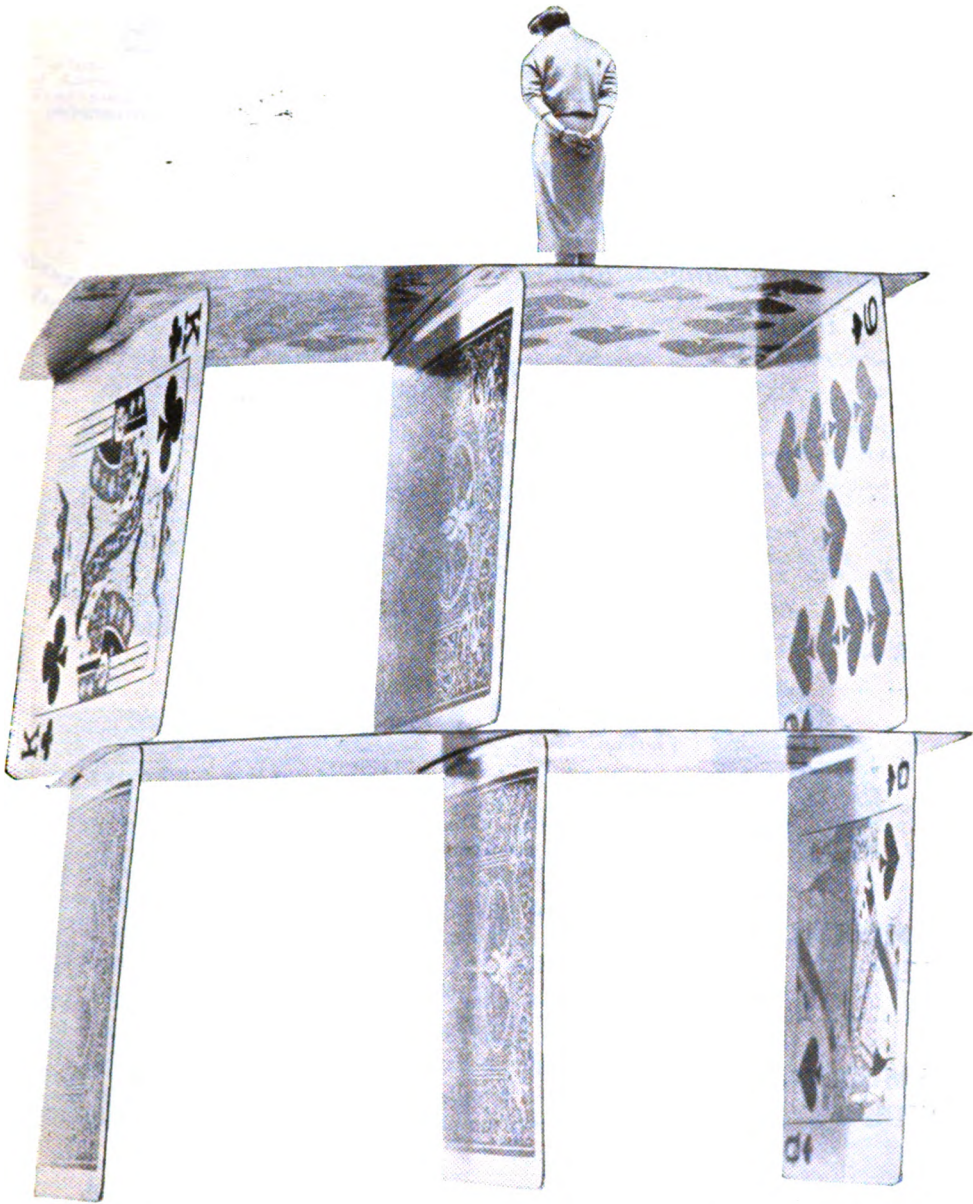
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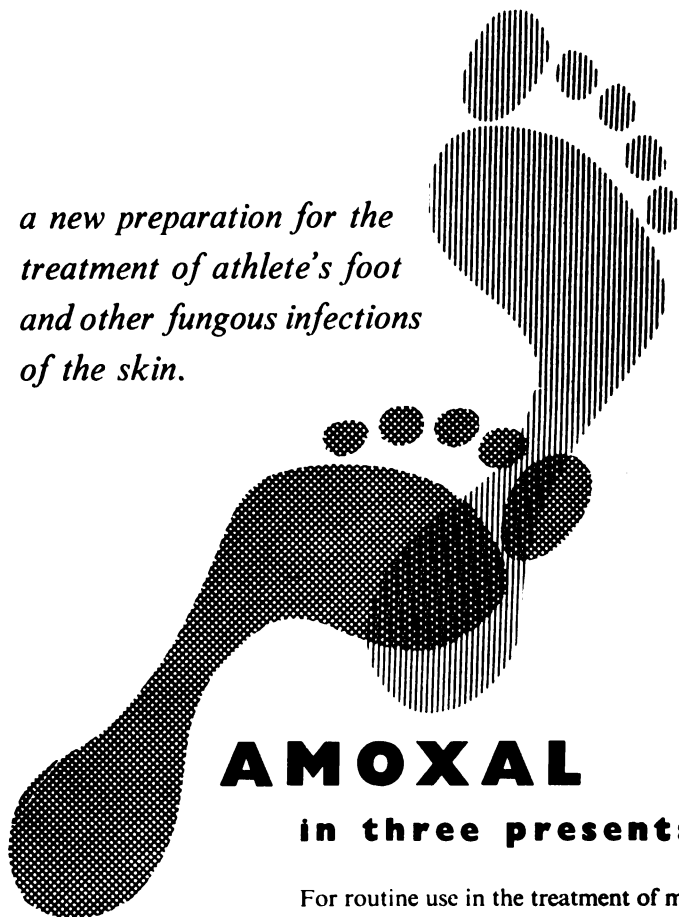
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BY

Major LAWRENCE L. GORDON

It is difficult to decide when medical officers were first appointed to the army, for before coming to a decision one must differentiate between appointments made solely for the benefit of the king and those for that of others. If the reader agrees with me that where we have information that only one appointment was made we may consider it a personal one, then 1345 is the first date on which I can trace the army having been thought of from a medical attention point of view. In this year a surgeon was appointed to the king's household, four for the army of North Wales, and three for that of South Wales. In this year, too, I found mention of inferior surgeons, who were called barbers, and others known as field shavers, and confess that my knowledge of the early history of surgery and medicine is not sufficient to distinguish between the roles of these people.

Early accounts of what we would now call medical attention make most amusing reading, and I cannot refrain from giving a few examples and extracts.

Henry V, in 1415, engaged Master Nicholas Colnet, a physician, to serve him for one year in Guyenne, or France. He was to bring three archers with him, and his wages were to be forty marks for the period plus a further twenty for the archers. In the same year Thomas de Moretede was appointed surgeon and had to bring with him twelve other surgeons and three archers. His pay was to be a shilling a day and half that for each of his assistants. He was allowed two horses and a wagon for his transport, but his request for money with which to buy instruments was refused. In the next year a William Bredewardyn was appointed to assist Moretarde, with instructions to impress as many more surgeons as he could, as well as artificers to make instruments.

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The degree of medical skill reached on the Continent in 1536 is well illustrated by the following remarks made in papers published in 1619. They state that wounds made by fiery engines should be cauterised with oil of elders mixed with a little treacle.

A famous Turin surgeon of the time is said to have used a balm for wounds which, if variety is the spice of life, might have prolonged it on that score alone without whatever therapeutic value there might be in the ingredients. The balm was made from "two young whelps, one pound of earth worms, two pounds of the oil of lillies, six ounces of terebinth of Venice, and an ounce of aqua vitæ." Having prepared this mixture, the surgeon then called on God to witness this balm which he used on all gunshot wounds.

It is a great pity that we have no statistics concerning the mortality rates during our earlier campaigns, for we could compare them with the remarkable figure of 6 per cent which was that published for the wounded after the landings in Normandy—a figure which does more to describe the efficiency and skill of the present Corps than many thousands of words of eulogy could ever hope to do.

In 1557, during the reign of Mary, surgeons were appointed to each of the generals at a salary of a shilling a day, and further on in the same account I read that they were appointed to the cavalry at two shillings a day, and to the infantry for one shilling and sixpence. We are left to form our own conclusions as to whether the price refers to the quality of the service administered to, or that of the service itself!

During the reign of Elizabeth I (1558-1603) there was a fixed charge of twopence a week for all troops to pay for their medical attention as and when required. An abbreviated extract of the regulations reads as follows:

"Surgeons should be men of sobriety, of good conscience, and skilful in that science, able to heel all sores and wounds, especially to take out a pellet. All captains must have such surgeons, and ought to fee them to have all their oils, balms, salves and instruments, and necessary stuff . . . allowing and sparing carriage for same. That every soldier, at the pay day, do give unto the surgeon tuppence, as in times past has been accustomed, to the augmentation of his wages; in consideration whereof, the surgeon ought readily to employ his industry upon the sore and wounded soldiers. . . . Regard that the surgeon be truly paid his wages, and all monies due to him for cares that by the same he may be able to provide all such stuff as to him needful. Such surgeons must wear their baldriske, whereby he may be known in time of slaughter, it is their charter in the field."

The mention of the baldriske is most interesting, for, in feudal times it was a belt, or band, normally worn round the waist, but sometimes over the right shoulder. It was an article of military dress, occasionally used to support the sword, which signified the dignity of the wearer, as may be noted in Westminster Abbey on the figures of the Earls of Pembroke and Lancaster. I have found a baldric (note the difference in spelling) described as a roll of material, or a roll of different bits of material, so that it may have served two purposes at the same time, one to distinguish the wearer, and, secondly, as a supply of material

for bandages. The latter suggestion is, of course, merely surmise on my part.

By 1620 the pay of surgeons had risen considerably, and so had their numbers, for we find that one was appointed to every troop of a hundred men at a salary of two shillings and sixpence a day. Physicians to the General's Train received six shillings and eightpence a day, and those appointed to the General Officers of Horse four shillings. The Ordnance and Pioneers were allotted one barber surgeon at two shillings a day, and two inferior surgeons at sixpence. The latter were what we would now call medical orderlies.

I am in no position to judge the standard of medicine and surgery of any era, but, when reading between the lines of such accounts that exist concerning medical attention in the field, there can be little doubt that the wounded man was considered little more than a damned nuisance, so much so that for many years in our history the badly wounded were given a small sum of money and told to find their own way home!

The Royal Army Medical Corps, as we know it today, dates from 1660, when Charles II formed a standing army. In its initial stages it was very dispersed, for both treatment and hospital service were on a regimental basis. Every regiment had its own doctor and orderlies who wore the badges of the regiment with which they served; that of the Corps today was adopted when it took its present title in 1898.

In addition to the regimental medical staff there were garrison medical officers and hospitals, the doctors for these being specially appointed. The rest of the staff was supplied from local units, with special enlistments for dispensers and clerks. The three senior officers of the Corps were known as the Surgeon-General, Physician-General, and Apothecary-General. The medical equipment and stores were under the control of a Purveyor, who combined the duties of paymaster and quartermaster. The few "other ranks" were known as hospital mates, hospital assistants, apothecaries' mates, and deputy purveyors.

A study of the conditions after the battles of the next few years would lead one to believe that very few of the wounded were evacuated from the scene in anything approaching the modern sense. Picked up from where they lay, yes, but only to be removed to some near-by house or barn where they were left to the mercies of the local inhabitants. It would, in my opinion, be grossly inaccurate to call such places hospitals, for on no single occasion have I found mention of the slightest effort to prepare any building with even such elementary requisites as a supply of clean (let alone hot) water. Of sanitation and hygiene there was none—in fact these were conspicuous by their absence quite apart from anything to do with the care of wounded. We must, however, be fair—or at any rate as fair as we can—and realise that there were no railways and only few and primitive roads, and that, with medical knowledge as it then was, it might well have been best to leave the wounded alone rather than complicate their injuries by a lot of inexperienced handling and jolting. It would, for instance, need a cast-iron constitution to withstand the application, whose

ingredients I have just mentioned, followed by a bumpy journey which ended with being thrown on a damp and dirty cow-barn floor. One might add, having mentioned the tuppence contribution, that the wounded, having paid their money, could take their choice, and one can hardly blame them if they preferred to be left alone.

The credit for being the first to organise an ambulance service in war must be given to Baron Dominique Larrey, a Frenchman, who joined the French army in 1792 at the age of twenty-six. He introduced what were called *ambulances volantes*, which were light vehicles that carried the necessary equipment to attend to the wounded on the field and then, when the situation permitted, removed them to what really were prepared places for giving them further attention. He went to Egypt with Napoleon in 1798 and on his return published, in 1803, what was the first account of a campaign dealing entirely with its medical aspect, with the title *Relation historique et chirurgicale de l'Expedition de l'Armée d'Orient en Egypte et en Syrie*. He had already, in 1796, published a work with the long title of *Dissertation sur les Amputation des Membres à la suite des coups de feu, étayée de plusieurs opérations* in which he points out the necessity of operating as soon as possible before gangrene sets in. He foresaw the wisdom of having what in the last war were called Advanced Surgical Centres, and it seems extraordinary that such did not appear till 168 years after—which figure I arrive at by thinking that these advanced centres did not come into being till after the landing on the Normandy beaches in 1944. In this I stand to be corrected by a year or two, but I most certainly cannot recall them at the end of the 1914-18 war or, for that matter, their use during the many operations that took place in India and elsewhere between the two Great Wars.

A contemporary of Larrey was Baron Percy, who formed a corps of *brancardiers*, from whom we probably got the idea of our Bearer Corps. Percy's men were specially enlisted and trained as such, whereas ours were obtained by detaching sixteen men from each regiment to act as stretcher-bearers, which is unsound as it weakens the trained fighting strength at a time when it is most needed. That the man is a bandsman in peace time and plays boogie-woogie to perfection may be economical, and even to some an asset, but there must be a sacrifice in training and skill in one of these two extremes.

Though Marlborough had considered his wounded, I think what might be termed the first British attempt to organise a system for the care and evacuation of casualties occurred during the Peninsular War, when "Collecting Posts" for the wounded were formed which were the forerunners of the Walking Wounded Collecting Posts of the First War. Their disadvantage, like those of the Peninsular War, was that many men staggered to them and there collapsed with shock, which I imagine can be—and in many cases often is—as serious as the wound.

The surgeons present, such as Guthrie, McGrigor and Millingen, to mention only three, realised the ghastly treatment which the wounded had to endure, but could not overcome the anger of Wellington at the thought that vehicles,

and a certain number of men, should be allocated to their care. The commander-in-chief was the commander-in-chief and his wishes, also his biases, ruled the day however absurd they may have seemed to the *cognoscenti* of the times.

We have never been a warlike nation so we treat wars rather as we do our weather—a beastly nuisance about which there is little that we can do, and the sooner the storm is over the better. When war breaks out we must, undoubtedly, do something about it. This something generally consists of sending the flower of our manhood to fill the gap while we do a bit of improvisation, followed by large purchases of out-of-date equipment at exorbitant prices, followed again by a perfect spate of production just before the show ends and nicely in time for the stuff to be sold at knockout prices as war surplus. At any rate, who would deny that something like that has not been the case in, and after, both the two Great Wars?

To read of the state of affairs after Waterloo one would think, and quite rightly so, that nothing had been done. The wounded were left to hitch-hike their way to Brussels; others, so I read somewhere, were lucky enough to have been carried on stretchers. It not only seems incredible, but is incredible, that after nine years of almost continuous fighting this state of affairs should still have existed. Sandwiched in between, or added to if you prefer, the actions from Maida (1806) and Waterloo there was the ghastly expedition to the island of Walcheren, on which some two hundred casualties were received from enemy action and nearly 24,000 from disease during the few months they were there in 1809!

In 1815 the fighting stopped and medals, for the first time in our history, were awarded to officers and men alike, but what did we do about improving the lot of the wounded and sick in any future war? The answer is simple and simply nothing.

There had been considerable fighting in Africa against the Kaffirs between 1834-5, 1846-7 and 1853-4 in which some fifteen British regiments, not to mention colonial units as well, had been engaged, but all this was a long way off, and as the medals for the first campaign were not awarded till nine years after it finished, it is more than probable that even the few who troubled to read about it cared very little what happened to the quick, the dead, and much less the wounded.

If this is not true, then it is difficult to explain how it was that when the Crimean War broke out in May, 1854, there had been no advance whatever in the military medical situation. I find it difficult not to laugh at the true situation which prevailed during that war. It has been glamourised by a somewhat inaccurate poem, *The Charge of the Light Brigade*, in which we are told that cannons volleyed and thundered to right and left of them, being left to infer that they were firing at them, though one side of the North Valley, down which the charge took place, was in our hands. However, in a campaign during the latter part of which the commander of the Light Brigade slept on his yacht *Dryad*, which was moored in Balaklava Bay, with the permission of the commander-in-chief, it is impossible to be surprised at anything that happened.

Incidentally, Lord Cardigan, the commander of the Light Brigade, came ashore on the morning of 25th October, found that he was wanted, mounted his horse, led the famous charge and then, after capturing the Russian guns, walked his horse back down the same valley, leaving his men to fend for themselves, and returned to his yacht. We often read about the sang-froid of the English in battle, but though I have read a good deal about our military history, this episode surpasses all the others with a large margin to spare.

When one reads this sort of thing can one wonder that the horse took precedence over medical equipment when they were re-embarked at Varna for the final stage of the journey to the peninsula?

I have made a careful study of the impedimenta that were disembarked and can only trace four vehicles which appear to have been allowed for medical use, but not a word concerning any horses to draw them! A unit designated the Hospital Conveyance Corps had been hastily scraped together—the word enlisted is hardly correct, for many of the men had not the faintest idea what they were supposed to do when they arrived at what they facetiously called the crime centre. I suspect that the whole idea behind the raising of this corps was a sort of face-saving device of the high-ups who suddenly realised how slack they had been during the last few years. I humbly apologise if I am wrong, but I have failed to find any mention of their services on any of the fields of battle. I have, however, found mention of the heroic efforts of bandsmen and the fighting personnel, under the guidance of the regimental medical officers, performing deeds of valour and self-sacrifice of which the members of the present Corps may be more than justly proud.

As a matter of strict fact, my grandfather, as C.R.E., was intimately connected with the building of the base hospitals at Scutari, 350 miles away from the scene of the fighting, and the state of affairs there was so terrible and outside our subject that I will leave it out. Miss Florence Nightingale, as all the world knows, did much to relieve the suffering, and it was through her writings and efforts, supported by Queen Victoria, that a Royal Commission was formed in 1857 to go into the whole matter of the care of the sick and wounded.

We must now retrace our steps so as to obtain continuity. In 1854, as already noted, the Hospital Conveyance Corps was raised, which on 21st July of the next year was amalgamated with the Land Transport Corps, which changed its title to that of the Military Train on 11th August, 1856, with the strange arrangement that the other ranks drew their pay at cavalry rates whilst the officers drew those of the infantry.

A Royal Warrant dated 11th June, 1855, announced the formation of a Medical Staff Corps, which can hardly be described as a military unit as the personnel carried no ranks in the military sense. This Corps, which had its headquarters at Chatham, was primarily responsible for the care of the sick and wounded after their return to England, though one of its companies landed in the Crimea. The rank and file had such titles as stewards, wardmasters, barbers, orderlies, cooks, and even washermen. The whole Corps was a hotch-potch and it is not surprising that it did not last longer than 1856.

On 1st August, 1857, the Army Hospital Corps was formed, the members of which were given army ranks and wore the same insignia. On the same date exactly seven years later the name was changed back to that of Medical Staff Corps.

The present title dates from 23rd June, 1898, when the Medical Staff Corps and the Army Medical Staff were united to form the Royal Army Medical Corps, which first went on active service as such with the Nile Expeditionary Force in the same year.

I would now say that the tables have been turned in the field of surgery as regards the civilian and military doctor, for the knowledge gained by the latter in dealing with the casualties of the two Great Wars must have been of inestimable value to the former and, I suppose, the same must be true to a certain extent as regards the prevention and cure of diseases.

I am not conversant with the numerous fields of medical science with which the Corps has had to deal since the beginning of the First World War, each with its own specialists and directorate.

Dentistry was, till 1921, a branch of the Corps, but in that year the Army Dental Corps was formed, which had the prefix "Royal" added in 1947.

The record of the Royal Army Medical Corps is truly brilliant, for I find that up to 1945 it has gained no fewer than twenty-six Victoria Crosses, and two of the only three to which bars have been awarded.

That is a truly remarkable record, but the Corps has another which I am quite sure is very little known. It concerns the Distinguished Service Order, instituted by Royal Warrant dated 6th September, 1866. The first ever awarded to an officer was gained by Deputy Surgeon-General Stewart Lithgow. It is, of course, necessary to include the qualification "to an officer" because, as with all Orders, the Sovereign is the first recipient after its institution.

The doctors will, I am sure, not mind if I end this story with a few words about those without whom it is inconceivable that they could work—the nursing sisters.

The early story of the part played by women in the care of the wounded is gained by inference rather than detailed knowledge. We have seen how in the primitive stages of the development of an ambulance service the idea was to get the wounded back to some village where, it is obvious, the army, so to speak, washed their hands as regards what happened to them afterwards. It is equally obvious that the maternal instinct found scope, for history is studded with various accounts of how women helped the wounded and then assisted them to find their way home. I would even go so far as to say that their help was taken for granted by both friend and foe alike. Though there are a few mentions in our early history of doctors being appointed to the army, there are none concerning women to care for the sick and wounded.

The first person who seems to have realised that women had a part to play in the care of their menfolk was Florence Nightingale during the Crimean War. She, as already mentioned, organised a team of devoted women who performed near-miracles with the slender resources available, and under conditions which

would give the members of the Farmers' Union apoplexy if they heard of the same on a farm.

In spite of all her efforts, it was not till 1881 that an Army Nursing Service was formed which, on 27th March, 1902, was replaced by Queen Alexandra's Imperial Military Nursing Service. Though, as I say, a regular nursing service was not formed till 1881, fourteen ladies were awarded the South Africa Medal, 1877-9, for their services during the Zulu War.

In 1907 a unit known as the First Aid Nursing Yeomanry was formed, and the ladies looked extremely becoming in their scarlet tunics, blue skirts, and forage caps. In 1936 the name was changed to that of the Women's Transport Service with the initials F.A.N.Y. added in brackets after it. This, much to the disgust of those serving in it, lost its identity in the A.T.S. (Auxiliary Transport Service), though they were allowed to wear flashes bearing the words "Women's Transport Service (F.A.N.Y.)" on their shoulders. In the last war they changed their role to that varying from general dogs-bodies to car greasers alternating with the duties of the A.T.S. and became completely divorced from anything to do with the medical service except, perhaps, to drive ambulances.

In 1941 the Queen Alexandra's Imperial Military Nursing Service and the Territorial Army Nursing Service were incorporated into the temporary women's forces. This lasted till 1949 when the Q.A.I.M.N.S. was organised into a Corps of the army with the title of Queen Alexandra's Royal Army Nursing Corps, and nurses were granted regular commissions.

THE HEALTH LESSONS OF CYPRUS, 1955-58

BY

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The background

In 1955 the task of the Army in Cyprus was twofold : firstly, to complete the redeployment from the Canal Zone, and secondly, to build up the two great new cantonments of Dhekelia and Episkopi. But on 1st April with the explosion of the first EOKA bomb a third factor was introduced. In spite of this threat, counter-measures were only slowly developed, and it was not until the arrival in the autumn of the new Governor, Field-Marshal Sir John Harding, together with the Commando, 50 and 51 Brigades and such reinforcements as the Royal Scots diverted on their homeward voyage from Korea, that positive action was taken. It was not a moment too soon. The first service death due to EOKA occurred at the end of October and terrorism began in earnest the following month. With the local police in difficulties, major units were widely dispersed with penny packets in every police station and mining company to prevent, in the former, their being overrun and their armouries being seized and, in the

latter, their explosives being stolen. The background to these events has been described elsewhere (Neild, 1958) and it is most important to remember the long confused history of this island.

At the beginning of the year, the garrison strength was about three thousand, consisting of a field regiment of artillery and two infantry battalions, all in semi-permanent accommodation—M.E.L.F. scale “C”—huttred offices, cook-houses and living accommodation with E.P.I.P. tents on concrete bases for sleeping. The proposed permanent garrison was to have been about three times this figure, but by the end of the year it was actually between six and seven times as great. To accommodate these additional troops, great engineer effort—Operation “Oystershell”—was put into constructing scale “A” camps consisting of the barest facilities using G1098 cooking equipment and 180-pounder tents. And it was in these bleak and cheerless camps, when sunbaked earth became overnight a sea of mud, that the troops first experienced the heavy rains of a Cyprus winter. On the credit side, the temperature never dropped below freezing point except in the Troodos mountains, where cold-weather clothing was essential, and it was seldom that the sun did not shine through after a day or two’s rain.

At that time there was only one old hutted hospital in Cyprus—the B.M.H., Nicosia. This had been put up at the time of the battle of Crete and, although rehabilitated on a number of occasions, still fell far short of modern hospital requirements. Prognostications, based on sick admissions for 1954, were gloomy, and it was feared that the B.M.H. would not be able to cope with the expected increase of admissions. It says much therefore for the sterling work in their isolated outstations of the young regimental medical officers, a number soon to be officially commended, that instead of the incidence rising it actually dropped by nearly 50 per cent. Next year (1956) Captain Ivor Reid, the families’ doctor in Famagusta, was to be mentioned in despatches for his work in treating the many injured in an ugly bomb incident to the Leicesters just outside Golden Sands; Captain Basil Shardlow, parachutist, was also to be mentioned for his gallant action in being lowered from the fullest length of cable from a helicopter into the charnel house of what remained of the survivors of the Troodos fire disaster; while Captain Graham Sutton of the Royal Norfolks was to be awarded the M.B.E. for his action that day on the ground. He was driving to the site of the disaster in his Champ when he was nearly caught by the same fire. Only by his presence of mind did he, his driver and orderly escape as their vehicle and equipment went up in flames. His name is now inscribed in the B.M.A. Book of Valour for 1956. Surgeon Lieutenant-Commander Guy Bradford, R.N. who tramped the Troodos hills with the Commandos, has described some of the medical work carried out by regimental medical officers in hill villages (Bradford, 1956), while even the D.A.D.A.H. experienced the occasional vicissitude (Tugwell, 1957). Doctors were as much a target as combatants—Captain Gordon Wilson of The Blues was shot dead in a Nicosia suburb in his own car on his afternoon rounds to his families, while Captain Ernest Dulson of the Wiltshires was very badly injured in a bomb

explosion immediately outside the families' medical centre in Kyrenia. He was later to be medically evacuated by air to the U.K.

1956 opened with the EOKA campaign in full swing, although the situation was slowly being stabilised with the local police greatly strengthened by the U.K. Police Unit. Early in the year occurred the dismissal of Glubb Pasha from Jordan. Similar events were to follow with monotonous regularity as a result of the waning British influence in the Middle East. Immediately two battalions of parachute troops were flown out from the U.K. and two new scale "A" camps had to be prepared almost overnight. About this time medical reception stations were opened at Famagusta and Polymedhia as well as at the R.A.F. Hospital at Akrotiri. In March, Archbishop Makarios was deported to the Seychelles and terrorism flared up again, to continue bitterly all through the long hot summer. With the nationalisation of the Suez Canal came the rest of the Parachute Brigade and many auxiliary units thus bringing the total strength to several times that of the permanent garrison. All these troops required temporary camps, the B.M.H. had to be expanded and preparations made for the reception of evacuees from all over the Middle East, and at the same time service families and most personnel were withdrawn from Jordan.

At the time of the Near East operation, EOKA intensified their efforts and, in fact, during November there were more deaths in Cyprus than amongst British troops in Port Said. Following Suez there was a gradual rundown in strength, but a formation was left to provide a much needed mobile striking force. There were several important successes before EOKA called off their campaign early in 1957, and shortly afterwards the Archbishop was released from the Seychelles. It was a relief for all service personnel living out of barracks to hand in their weapons, and then for almost a year there was comparative peace except for the small Oman operation. Although the few infantry reinforcements required were flown to the Persian Gulf from Kenya, the additional technical personnel were found from Cyprus and they included a surgical team and the S.M.O. Force—Lieutenant-Colonel Norman Hamill, the O.C. 2 Field Ambulance. During this time the number of families almost doubled and this gave rise to many difficult problems. As the majority of families went to the large towns of Nicosia, Limassol and Famagusta, where there were no quarters and only limited W.D. hirings, they had to make their own housing arrangements. It is difficult enough for a young couple to set up home for the first time near relatives in England, but unbelievably difficult in Cyprus to come out to an isolated empty house, furnish it, buy or hire a refrigerator and shop locally without transport in the heat of summer with temperatures ranging from 90 to 100 degrees. As the majority of families had come by air, there was little time for preliminary briefing in tropical hygiene to be done and it was difficult for the all too few S.S.A.F.A. sisters to trace the houses of the newly arrived in the vast sprawling Cypriot suburbias—"Fifth turning past the water tank in Omorphita" was a typical address! It is sad to report that during this summer there were five deaths and one hundred and fifty admissions for infantile gastro-enteritis to the B.M.H.

Towards the end of the year Sir John Harding left, and to greet the arrival of Sir Hugh Foot, EOKA began fresh incidents while the Greek Cypriot right wing began to turn on the left. An additional factor was then introduced into the situation by the Turkish Cypriots deciding to emphasise their rights, possibly because of the fear of being "sold down the river," and fiery riots broke out in January of 1958. This created a very difficult situation, as all the mobile reserve police and the majority of the W.D. and R.A.F. auxiliary police were Turkish Cypriots. With the announcement of the British "partnership" plan for Cyprus, inter-communal rioting flared up and all through the long summer there were ugly incidents, bringing life almost to a standstill with the many curfews. To control the situation a large number of arrests were made, and EOKA retaliated by striking again at the security forces. During this time the medical supervision of the detainees became a very time-consuming military commitment owing to the almost complete lack of expatriate Colonial medical cover. To complicate the already difficult internal situation, the external one in the Middle East was deteriorating—the Lebanon in turmoil, the Iraq government overthrown by a *coup d'état* and the Jordan monarchy unstable. This situation necessitated the reorganising of a field ambulance to a brigade medical company and finding a surgical team from the island's resources. Before these units were required, the Americans had landed in Beirut and the Parachute Brigade flown out from home and on to Amman. With the latter came also the Guards Brigade and 19 Brigade, so within a matter of a month in the heat of summer, three additional brigades, one in transit, had to be accommodated literally at a moment's notice in Cyprus, while the old B.M.H. in Nicosia was once again expanded as the new B.M.H., Dhekelia, was not to open until the end of September. By the end of October the general situation in the Middle East had so far improved that all American and British forces were withdrawn from the Lebanon and Jordan respectively, but the Cyprus situation had deteriorated with murderous attacks on unarmed civilians.

Health of Troops

As has been mentioned, the health of the troops was exceptionally good in spite of the poor accommodation they were living in. In fact the incidence of admissions to hospital, as compared with 1954, dropped by nearly 50 per cent to a bed requirement of about three-quarters of one per cent of the total strength. In 1954 the main causes of medical admissions to hospital were upper respiratory infection in winter and diarrhoea and dysentery in summer. With the former, troops living under canvas always have a much better health record than those living in permanent accommodation and, with the latter, good camp sanitation supplemented by *immediate* treatment with the sulpha drugs has virtually flattened out the summer rise of diarrhoea and dysentery, and it is in this respect that the regimental medical officers played such a vital role. It must always be remembered, too, that sick rates are lower when morale is good, and morale is good when troops have a definitive interesting task to carry out such as

chasing terrorists as opposed to their previous one in 1954 of acting as mere labour for the redeployment.

With the enormous reduction in medical admissions to hospital, the major group cause of admission had now become "other injuries." It is important to remember that, even at the various peaks of terrorism, deaths and injuries due to terrorists barely topped the sum total of road accidents and accidental shootings and such injuries as burns, drowning and falls while climbing. This again emphasises the importance of first-aid training, and here again the regimental medical officer was worth his weight in gold. Service casualties were all evacuated to hospital by helicopter* and most medical evacuation from the island was done by air.

Scale "A" camps, consisting of the barest structures, are merely very temporary camps designed for some three to six weeks. However, troops were often in them for months before authority was received from the War Office to increase or improve them to scale "B." With this improvement was included a hutted medical centre with running water in which "no-touch" technique was practised and the pack system of sterilised dressings introduced, both most important in the prevention of septic skin lesions. The main health hazards of a scale "A" camp were that when fresh rations were issued there were no proper facilities for food storage, preparation and washing-up, and, secondly, the Middle East's mania for bucket latrines and Elsan closets. It was not until convincing evidence was produced to show that a unit on bucket latrines was sixteen times more at risk contracting diarrhoea and dysentery than deep trench latrines in these camps were authorised. Although the use of Elsans in the B.M.H., Nicosia, and the leave camp Troodos was a source of much biting comment, it was not until 1958 that plans for their replacement by water-borne sanitation went forward to the War Office. Sullage disposal was also a very intractable problem and requires almost a book of explanation. With all the rivers in Cyprus dry except when in spate during the rains, the normal Cypriot method for sullage and sewage disposal is by septic tank into an absorptive pit or by simple pit latrine, the only civilian sewage plant being a joint one for the Central Prison and General Hospital, Nicosia. The Army has built a large sewage plant in Episkopi and smaller ones in the two prefabricated villages of Berengaria and Richmond, but otherwise it relied on grease traps and soakage pits. The latter inevitably overflowed and the nuisance was only controlled by digging fresh pits or emptying by sullage tanker, both expensive procedures. In the long-term camps chemical plants were installed, but this still did not remove the problem of the final disposal of the effluent. In the training of regimental sanitary duty personnel, No. 1 Hygiene Wing in the grounds of the B.M.H. played a very valuable part.

With the speed of air transportation by Comet—five hours direct ex-U.K. and twelve via Malta—units often arrived in Cyprus within a matter of forty-

* The Near East operation was a particularly striking example of the use of the helicopter in casualty evacuation. Although the B.M.H., Nicosia, had been cleared, all battle casualties were flown by helicopter from Port Said direct to the surgical facilities available on aircraft carriers.

eight hours of receipt of information of their coming, so that it was impossible to get even a scale "A" camp erected in time, always presupposing that the local labour force was not under curfew. This meant that units should have been prepared to help themselves by a great deal of "self-help," and it was particularly essential that they had sufficient trained regimental sanitary and water-duty personnel on arrival. Most incoming formations were woefully lacking in this respect and relied heavily on local resources. Moreover, however fit personnel may be in the U.K., if they arrive by air in the heat of a sub-tropical summer they still require approximately a fortnight to acclimatise if they are not going to suffer casualties from heat effects. In passing, at the time of the Suez crisis and subsequently, endless time was wasted over smallpox vaccination documentation. Reinforcement drafts arriving by air usually had their Fs. Med. 101 packed away and, as the R.A.F. would not accept A.B. 64 Pt. I evidence, surveillance forms had to be completed by all. Another anomaly is that the international certificate and the R.A.F. require vaccination every three years while the Army every two. No doubt vaccination every two years provides better protection than three, but whenever there was a smallpox scare in the Levant or Arabian Peninsula, vaccination requirements went down to every year or even six months, so that the two-year period would seem quite pointless and merely a potential source of friction between the Services.

In 1955 all short-term fevers were lumped under the heading of "Cyprus 'flu" in winter and "sandfly" in summer. They are now being slowly identified—a considerable number in the early part of the year are "Q" fever, and both sandfly and dengue also occur. In passing, investigation of paired sera taken at random from a number of Cypriots in the Nicosia General Hospital showed many short-term African fevers. Infective hepatitis occurred sporadically throughout the year, but the peak incidence always coincided with the rise of upper respiratory infection in winter. Internal Security troops were rarely affected and there was a much greater incidence in families, seldom from those in quarters but almost entirely those living in hirings in close contact with the local population. In the first half of 1958 there was a sharp outbreak of poliomyelitis, children and pregnant women being mainly affected, while the majority of service cases were married personnel living out in hirings. The civilian cases were mostly children under five. Fortunately poliomyelitis vaccination had been started in autumn, 1956, and by mid-year 1958 over 60 per cent of service children had been immunised.

Amenities for the troops were very thin on the ground, particularly as local restaurants, bars and cabarets were usually out of bounds. Most units had a N.A.A.F.I. or a canteen run by Pakistanis. To supplement this service in small camps, civilian wives ran a tea service of their own, while there were a few Churches' Voluntary Welfare Workers institutes in the various towns. There was also an other ranks' hotel at Kyrenia, and in summer the leave camps at Troodos for married personnel and at Golden Sands, Famagusta, for other ranks were opened. In Nicosia there was a N.A.A.F.I. club with swimming pool and also an officers' swimming pool. Outside the island there were various

sponsored leave schemes to Turkey, Lebanon and Israel, but many single persons preferred saving up for the reduced air fare home. Splendid amenities for both officers and other ranks had been built in the new cantonments, but with the redeployment of troops these were only available for a very small percentage of the island. This redeployment problem also affected the siting of the B.M.H., Dhekelia, which was eccentrically situated in regard to the operational distribution of troops. Messing was also a very difficult problem. Equipment was poor and four meals a day for three hundred and sixty-five days had to be provided for troops who had little opportunity to supplement or sample any variety outside. In addition, the new overseas ration scale of 1957, although more varied than the old, came in for criticism from the troops in Cyprus on the grounds of lack of bulk as they had previously been on the old scale plus the "arduous" supplement. In 1958 a Cyprus supplement and a small ration cash allowance were introduced. On operation, "compo" was issued, but for troops operating in mountainous areas there is really a need for the issue of twenty-four-hour packs.

Health of Families

Except for gastro-enteritis in summer and the short-term fevers, the diseases in families followed a temperate climate pattern—that is, a great deal of upper respiratory infection in winter and the whole range of childish infectious diseases throughout the year, with diphtheria still a very real danger. Family hospital beds were planned at one and half per cent of family heads and there was constant pressure on them. As has already been mentioned, the influx of families in 1957 produced many problems, particularly in the towns where there were no quarters (in the whole island quarters provided only one-fifth of families' accommodation available). These problems were brought under control in 1958 by insisting on medical inspection of all hirings before tenancy agreements were signed, early visiting by S.S.A.F.A. sisters and stimulation of regimental wives' committees. Although major units had a good record in this respect, most minor units were somewhat indifferent. There were never enough S.S.A.F.A. sisters even for the scale of one per fourteen hundred family heads, which is a very small one for a widely dispersed community in hirings. With the speed of air transportation, it was not possible to brief families adequately on the conditions to be expected and health hazards to be avoided. For instance, the adequate sterilization of feeding bottles is probably the most important factor overseas in the prevention of infantile gastro-enteritis. It is to be remembered, too, that service families from the four corners of the U.K. only came under military supervision some twelve hours before their arrival by air in Cyprus!

If unlimited families are to be encouraged overseas, then the Army medical services must be able to give as good a service as the National Health and school health services at home. But these services are difficult to run overseas as so few medical officers have experience of working in them at home. It was not until 1958 that the majority of family medical centres were officially

authorised, so that they could be properly staffed, thus relieving S.S.A.F.A. sisters of a multitude of routine tasks in them to concentrate on their proper function of visiting families in their homes. The number of school children also was so large that it was impossible for families' medical officers to keep pace with the statutory inspections, nor were there any satisfactory facilities for handicapped children.

SUMMARY

Emphasis on medical care is now forward and medical officers there, both regimental and families', have at their disposal overseas, firstly, trained ancillary helpers such as the area hygiene assistant and S.S.A.F.A. sister, secondly, the knowledge and thirdly, the drugs to control the majority of preventable disease at source.

With the speed of air transportation, formations leaving the U.K. for operational areas cannot expect completed camp sites on arrival. They must be prepared to do more to help themselves and have with them sufficient trained regimental sanitary and water duty personnel on arrival.

Air transportation brings very much to the fore the problem of acclimatisation of troops arriving in the heat of summer and that of the importance of preliminary briefing of families in the problems of tropical hygiene.

Air transportation has revolutionised casualty evacuation. Helicopters now work direct from R.A.P. to base hospital without any intermediate link, cutting down in Cyprus, for instance, an agonising journey of six hours along a mountain road to less than one hour by air. In addition the vast majority of "casevac" now go by air to the U.K.

If the Army medical services are to run the equivalent of a National Health service and school health service abroad, then the teaching on these subjects must be introduced into service training of medical officers at all levels at home.

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GERIATRICS IN THE ARMY

REPORT OF A CASE

BY

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It is still uncommon to be able to submit a fairly complete medical report on a centenarian ; it is rare to be able to do so in the case of a professional soldier who, in the normal course of duty, runs greater risks to life than does a civilian. Probably the earliest recorded instance of a soldier reaching a hundred years of age is that of Nestor, who took part in the famous Trojan War. Coming down to more recent times, a case is presented here for its historical and medical interest.

BIOGRAPHICAL DETAILS

The patient was born in Ross-shire, Scotland, on 25th November, 1852, and becoming a sailor at fourteen years of age, he served in a windjammer for five years. He enlisted in the British Army when nineteen years old and, after completion of his military training, he sailed with the Gordon Highlanders in 1874 for Natal. Later on he transferred to the Army Service Corps.

He was in action at Rorke's Drift (1879) and in the battle of Ulundi, the Anglo-Boer War of 1880-1, the Mashonaland campaign of 1896 and the South African War of 1899. In 1914 he re-enlisted for training recruits locally, but was too old to go overseas on active service.

On his final retirement from military activities he lived in Durban—a place to which he had been posted initially on his first arrival in South Africa eighty years previously. He still took a keen interest in military gatherings and social functions during his retirement. His personal requirements were simple. He apparently did not smoke, but he used to enjoy drinking beer regularly although not in large quantities. He was clean in his habits and very independent indeed. He remained a staunch bachelor all his life.

MEDICAL HISTORY

Apart from a suprapubic prostatectomy (the date of this operation being unknown), he apparently enjoyed complete health until quite recently. On 19th July, 1955, he fell down and fractured the neck of his left femur. At this time it was noted that his pulse was 100 per minute, a few extrasystoles were present and his blood pressure was 150/90. Air entry into both lungs was good and no crepitations were to be heard in the chest. The fracture was operated upon, a vitallium Smith-Petersen pin producing an excellent functional result within three months of his sustaining the original injury.

On 18th June, 1957, when he was 104 years old, he was admitted to hospital for a mild aphasia which improved rapidly. At that time the following investigations were done: Blood—Hæmoglobin 12.1 g. per cent. P.C.V. 38 per cent. Total W.B.C. 6,000 per cu. mm. W.R. negative. Blood urea: 27 mg. per cent. Urine—N.A.D.

Radiographs showed a mild unilateral bronchopneumonia and an increase in size of the heart shadow. Porencephaly was present. This bronchopneumonia responded to chemotherapy and to physical exercises and he was discharged convalescent after one week in hospital.

On 6th August, 1957, he was admitted once more with a complaint of breathlessness. On examination his blood pressure was 130/80 mm., there were occasional extrasystoles present, and no pulse was detected in the left dorsalis pedis artery although other peripheral pulses were felt. Bronchovesicular breathing was heard at both lung bases, and both lungs showed poor over-all expansion. His prostate was enlarged, hard, and no median groove was palpable. The results of further investigations at this time were: Urine—N.A.D. Sputum—N.A.D. E.C.G.—extrasystoles only, suggestive of coronary disease but not

considered to be diagnostic of a coronary thrombosis. In view of his advanced age it was considered unjustifiable to perform many investigations on him.

He improved considerably on the broad-spectrum antibiotics, but he had a relapse with breathlessness and bilateral basal pleural effusions two weeks after his admission to hospital. Further investigations then showed the following :

21st August : Hæmoglobin 14.1 g. per cent. P.C.V. 47 per cent. Total W.B.C. 8,000 per cu. mm., neutrophils being 83 per cent. Blood urea 26 mg. per cent.

25th August : Marked dyspnœa. Pulse 140 per minute, small volume. Generalised crepitations throughout both lungs. A repeat E.C.G. showed no change.

27th August : General condition continued to deteriorate slowly. Blood urea 76 mg. per cent. Electrolyte studies showed sodium ion 147, potassium ion 3.9, chloride ion 106 mEq. Alkali reserve was 26 mEq.

30th August : General condition continued to deteriorate. Blood urea 118 mg. per cent. Electrolyte studies were repeated and showed sodium ion 157, potassium ion 5.1, chloride ion 105 mEq. Alkali reserve was 28 mEq.

He died quietly on 2nd September, 1957, and an autopsy was performed thirty hours later.

AUTOPSY REPORT

External appearance

The body was that of an old European male, almost completely bald but with a long, white beard. There was slight generalised wasting only. An old suprapubic scar for a prostatectomy and a scar over the left hip for the Smith-Petersen pin was noted. A few of his own teeth were still present and appeared to be in good condition.

Internal appearance

All organs were in a good state of preservation. *Lungs*: small, bilateral, clear pleural effusions ; acute bronchiolitis, pulmonary œdema and congestion were noted in all areas. No atheroma noted in pulmonary vessels. *Heart*: small, clear pericardial effusion ; slight dilatation of mitral ring with slight calcification of mitral cusps ; slight calcification of aortic cusps and of chordæ tendinæ ; all the valves were effective ; the muscle of the left ventricle was 19 mm. thick, that of the right ventricle being 6 mm. thick ; an old mural thrombus was attached to the wall of the left ventricle over an infarct (about 5 mm. in length) involving the interventricular septum at the base of the heart ; moderate stenosis due to atheroma was noted in the coronary arteries ; slight atheromatous changes were also found in the aorta and systemic arteries, more severe in the distal portions of the vessels. *Intestines*: slight congestion of the cæcal mucosa only. *Liver*: simple atrophy of both lobes, left slightly more than the right. Early nutmeg pattern present. Small hepatoma present in right lobe, about 10 mm. in length. *Kidneys*: bilateral severe degree of ischæmic change ; the vessels were very prominent ; large simple single cyst found in the cortex on the right side ; the capsule stripped readily. *Prostate*: large, slightly calcified, nodular lateral

lobes. Median lobe moderately hypertrophied. No extension of gland outside the capsule was seen. *Bladder*: normal, no hypertrophy found. *Testes*: normal, a few simple small cysts were present in the epididymis. *Spleen*: small, fibrous and contracted. *Suprarenal*: normal. *Thyroid*: moderately large calcified nodule, about 3 cm. long, found in the left lobe. Not adherent to other structures. *Brain*: occasional very minute cysts seen in right thalamus. No evidence found of any previous cerebral damage. Pituitary gland appeared normal.

Additional comments—no osteo-arthritis noted in the spine. The Smith-Petersen pin was in good position in the head of the left femur, bony union having taken place previously. Some osteo-arthritis of the left hip joint, with slight flattening of the head of the femur, had occurred.

HISTOLOGY REPORT

Brain: thalamus contains a number of "corpora amylacea" but shows no other abnormality. *Thyroid gland*: shows fibrosis separating acini which are lined by low cuboidal epithelium and contain pale-staining colloid. An occasional large acinus is seen. In the gland, with a partial fibrous capsule, is a mass of large cells with eosinophilic cytoplasm, in places arranged in a solid acinar manner. These cells show well-marked variation in both cell and nuclear size and a considerable number of the nuclei are hyperchromatic. Mitoses are not a feature, but in view of the above this is considered to be a carcinoma rather than an adenoma. Calcific deposits are present in the fibrous tissue surrounding the tumour. *Heart*: Severe degree of myocardial hypertrophy and interstitial fibrosis. Multiple infarctions present of varying ages. Large recent infarct with organising mural thrombus present. *Gall bladder*: atrophic. *Aorta and carotid vessels*: Moderate atheromatosis. *Lungs*: Bronchiolitis and bronchopneumonia. *Kidney*: Moderate senile ischaemic changes. Severe medial degeneration of afferent vessels. *Spleen*: Congestion and fibrosis due to congestive cardiac failure. No pigment deposits found. *Liver*: Moderate passive congestion. There is a nodule of tumorous cells surrounded by compressed liver tissue and containing, peripherally, numerous thin-walled blood-vessels. The cells of this mass resemble those of the thyroid tumour and this is considered to be a secondary deposit, even though the liver is not a common site for secondary deposits of a thyroid carcinoma. *Prostate gland*: Shows hyperplasia and also an adeno-carcinoma which is infiltrating lymphatics and peri-neural lymphatics. *Testes*: Atrophied with considerable increase in stromal fibrous tissue. Interstitial cells scanty but present. *Suprarenal and pancreas*: N.A.D.

Conclusion: Cause of death was *bronchopneumonia* secondary to *cardiac failure* following *myocardial infarction*.

COMMENTS

The previous medical history was to a great extent unknown. It was noteworthy that there was no evidence of former battle injuries or of such diseases as malaria,

schistosomiasis, trypanosomiasis or enteric fever found at autopsy, although he must have been frequently exposed to some of these diseases during his campaigning days with the army.

In general, most organs of his body were in a remarkably healthy state. It was interesting to note that he still had some of his own teeth present. In spite of the atrophy of both testes, some morphologically normal spermatozoa were being produced from residual testicular tissue. This does not mean that such spermatozoa were functional, particularly in view of the atrophy noted in the prostate, but it demonstrates that the testis may continue to function for much longer than has been thought previously.

As regards the final results of the healing of his fractured femur, the surgeon was most impressed with the state of his tissues at operation and the rapid recovery afterwards. At autopsy it was difficult, in fact, to find the surgical scar made by the incision through the skin, because healing had been so complete. The vitallium pin caused no trouble locally, allowed bony union to occur and did not interfere with full movement of that joint.

Howell (1957) mentions a type of chronic bronchitis only found in old people over eighty years of age. On first impressions, one may have considered this case to have been an example of this condition, but the histology of the lung did not confirm it at all. It was noteworthy that his cardiac condition was severe enough to produce clinical signs of cardiac failure and recurrent myocardial infarctions were demonstrable in histological sections, yet these pathological changes could not be conclusively demonstrated during life, even with the aid of E.C.G. studies.

SUMMARY

A case of a professional soldier who had taken part in several major campaigns is presented. He succeeded in living well over a hundred years and died quietly in a civilian hospital.

Biographical and medical details are provided, as well as autopsy and histology reports on his final illness.

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I wish to thank Dr. H. D. Tonking, Provincial Pathologist, Natal, for permission to report this case, and Lieut.-Colonel D. W. Bell, R.A.M.C., for confirmation of the histological reports.

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AN OUTBREAK OF BACILLARY DYSENTERY IN AN ISOLATED ARMY ESTABLISHMENT

BY

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THIS account describes an outbreak of dysentery occurring in an isolated army community. The causative organism was a sulphonamide-resistant *Shigella sonnei*. Altogether some 29 persons were involved, of whom 28 were acute cases, while the other was a symptomless excretor, who was considered the reservoir of the infection.

At the time in question the camp was a Mobile Defence Corps Training Centre. The permanent staff, consisting of 30 officers and 130 other ranks, was concerned with the teaching of rescue and first aid. The trainees were National Service men in their final month of service. One hundred and seventeen trainees were undergoing instruction at this period. The incidence of cases amongst these two groups was approximately equal, although no case occurred amongst the officers and senior non-commissioned officers of the permanent staff.

The extent of the outbreak was limited by the application of routine measures and oral antibiotic therapy.

THE OUTBREAK

The outbreak commenced suddenly on 13th November, 1958, when five soldiers reported sick with a complaint of abdominal colic and diarrhœa; these men were confined to bed in the Medical Reception Station. The following day a further eight men were admitted with similar symptoms. As only seven beds were available in the Reception Station itself, additional accommodation was arranged in an adjacent barrack-room where adequate toilet facilities were available. A further fifteen cases had been admitted by 21st November, after which no further cases occurred. Conversation with the local practitioners indicated that they had not encountered any evidence of a dysentery outbreak in the surrounding district.

Clinically, the disease was mild. All the patients complained of abdominal pain and diarrhœa. The frequency of bowel action varied from two or three semi-fluid motions up to twenty in the first twelve hours. Mucus was noted in the stools of eight patients on several occasions, while blood was noted in three cases. Pyrexia was present in all cases, the average varying between 99° and 101° F. Only one patient developed a temperature of over 103° F. Pyrexia tended to subside within three days of admission.

Fæcal material was submitted for bacteriological examination in the first ten consecutive cases. Ideally culture should have been carried out in every case, but it was considered that an undue strain would have been placed on the limited local laboratory facilities. Furthermore, subsequent cases were clinically almost indistinguishable from the bacteriologically proven cases. There could be no doubt about the accuracy of the diagnosis.

ORIGIN

Cases of dysentery occurred only amongst the trainees and those members of the permanent staff below the rank of sergeant. No cases occurred amongst the permanent staff officers and senior N.C.Os. nor among the M.R.S. staff, all of whom have separate dining arrangements and who never eat in the main dining hall nor in the N.A.A.F.I. canteen. This fact would tend to incriminate either the main dining hall or the N.A.A.F.I. staff as the source of infection. Further, as no cases had been reported in the surrounding district, the camp outbreak was not part of a general epidemic in the neighbourhood.

A detailed history revealed that all the patients were in the habit of eating in the N.A.A.F.I. canteen. All of these men had eaten there on one or more occasions during the week before the onset of symptoms. Most had done so within the previous four days. The most popular item of food seemed to be cold meat pasties. It was thought that on this evidence the N.A.A.F.I. was the most likely source of infection.

The co-operation of the N.A.A.F.I. employees was readily obtained and faecal specimens were collected from all the kitchen and counter staff. Bacteriological culture of these samples gave one positive result for *Sh. sonnei*. This specimen had been provided by a girl who was employed as an assistant on the food display counter. She denied having any symptoms, nor could she ever recall having had an acute attack of diarrhoea at any time in the past. She had only arrived in the area a short time before. She was at once (26th November) taken off food handling and given alternative employment as a cleaner.

It was decided to treat the girl with oral streptomycin in an attempt to clear up the condition, but for reasons outside our control this could not be carried out.

TREATMENT

Bacteriological studies indicated that the organism responsible for the dysenteric outbreak was a *Sh. sonnei*. Sensitivity tests showed this particular strain to be resistant to penicillin and the sulphonamides. While only slightly sensitive to the tetracyclines, full sensitivity was demonstrated to streptomycin and chloramphenicol. Streptomycin appeared to be the drug of choice.

In the present outbreak the treatment régime was based on the dosage recommended by Sangster (1956). Patients over ten years of age in his series received two grammes of streptomycin daily. At least 80 per cent of these patients were cured by one course of treatment : 95 per cent were cured by two courses. Oral streptomycin also proved highly effective in clearing symptomless excretors.

Therapy was instituted as soon as the initial bacteriological reports were returned from the laboratory. Streptomycin was administered in a dosage of one gramme twice daily for five days. Orange cordial was used as a flavouring medium. Symptomatic treatment was given in the form of kaolin and morphine mixture B.P.C. in a dosage of 30 millilitres twice daily. Diet was light ; no case was considered sufficiently severe to warrant fluids only. After five days'

treatment all cases were asymptomatic. Cure was confirmed by culture of faecal specimens some fourteen days later : all these proved negative.

Unfortunately the effect of oral streptomycin on the symptomless excretor was not ascertained as she left the district several days after being taken off food handling.

DISCUSSION

Bacillary dysentery continues to be prevalent in this country. It is now generally held that sulphonamide-resistant shigellæ are widespread. This fact would tend to re-emphasise the need for bacteriological control in the treatment of the condition.

In the present series, streptomycin is without doubt the drug of choice. Zintel *et al.* (1945) have shown that streptomycin administered orally results in high intestinal concentrations with negligible quantities being absorbed. Sangster (1956) reported a series of 1,474 cases of proven bacillary dysentery, collected between 1949 and 1954, treated with five-day courses of oral streptomycin. Of these 1,421 were acute cases, while 53 were symptomless excretors. Forbes (1953) has shown that, *in vitro*, streptomycin destroys *Sh. sonnei* in a lower concentration than aureomycin, chloramphenicol or oxytetracycline. Resistance, however, develops with comparative ease. The other two possibilities in the present outbreak could have been chloramphenicol or one of the tetracyclines. Chloramphenicol has certain well-known disadvantages and is easily ruled out. The main disadvantage of the tetracyclines is the fact that they can cause bowel disturbances and thus confuse the clinical picture. A further advantage of streptomycin when taken by mouth is the fact that it is non-toxic and largely appears unchanged in the faeces. The effect of oral streptomycin on the length of illness is a matter for conjecture. However, the rapid control of diarrhoea probably reduces the risks of auto-infection and cross-infection and it is thus justifiable to use every means to this end. Faecal culture fourteen days after symptoms had remitted gave no positive results. It is doubtful if this result could have been achieved without anti-bacterial therapy.

It may be considered remarkable in view of the large numbers of men using the N.A.A.F.I. canteen that a much larger outbreak did not occur. The excretor was well placed to disseminate organisms and no doubt would have continued to do so had she escaped detection. It is perhaps fortuitous that a much smaller number of trainees were undergoing the Mobile Defence Corps course than usual.

The amount of bacteriology carried out in this outbreak was largely determined by the facilities available. Although ideally more bacteriology was required, sufficient faecal culture was undertaken to base treatment on a scientific foundation. Once the nature of the organism was ascertained it was thought that the limited laboratory facilities could most advantageously be used to screen cook-house and N.A.A.F.I. staff. The rapid elimination of the symptomless excretor was the gratifying result.

SUMMARY

A small outbreak of dysentery due to a sulphonamide-resistant *Sh. sonnei* is described. The treatment with oral streptomycin is discussed. Rapid elimination of a symptomless excretor, oral anti-biotic therapy and isolation of the patients limited the extent of the disease.

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SALMONELLA PARATYPHI BO AGGLUTININ LEVELS IN PARATYPHOID B FEVER

BY

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THE sera described in this paper were taken from 107 proved cases of paratyphoid B fever and 38 undiagnosed cases of pyrexia occurring over the same period during an outbreak in the Royal Sussex Regiment in the Canal Zone, Egypt, in 1952. None of the patients received chloramphenicol or any other antibiotic during the course of their illness. All had been immunised with T.A.B. vaccine.

MATERIALS AND METHODS

Sources of sera. Sera from the following sources were examined :

1. Proved cases : total in outbreak : 107
Cases providing at least one sample : 100
Cases providing two samples at intervals : 44
2. Clinical enteric fever cases : total in outbreak : 38
Cases providing at least one sample: 29
Cases providing two samples at intervals : 18
3. W. R. sera (as controls) : 32.

"Proved cases" were patients from whose stools or blood *Salmonella paratyphi B* was isolated at least once by standard methods. "Clinical enteric" cases were patients from the same unit who had pyrexia during the outbreak and from whose blood or stools no pathogenic organisms were isolated in spite of repeated examinations. Control sera were selected at random from samples sent for routine W.R. investigation. Cases providing W.R. sera were clinically well and belonged to other units, in which no enteric infections were occurring at the time.

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Serum was collected from clotted blood left overnight at 4° C. and was stored at 4° C. until titrated.

Titration of sera. Doubling dilutions of serum in 0.9 per cent saline were made from 1 in 10 to 1 in 320 in 3 in. $\times \frac{1}{2}$ in. tubes, leaving 0.5 ml. in each tube. 1/40 ml. of concentrated standard BO suspension containing 8×10^9 organisms per ml., supplied by The David Bruce Laboratories, was added to each tube. A saline control and the same positive serum control were included in each batch of titrations. Tubes were incubated at 37° C. for two hours, then placed at 4° C. overnight and read next day after standing at room temperature (20-22° C.) for one hour. The end point was taken as the last tube showing agglutination visible to the naked eye. Paired sera were always titrated in the same batch.

RESULTS

Distribution of serum titres in the first two weeks after onset of illness. The results from all samples taken during the first two weeks are compared in Table 1. The following facts emerge :

Table 1. *Percentage distribution of anti-BO titres in sera taken in the first two weeks of illness, and in control W.R. sera.*

Category	No. of sera	Serum Titre						
		< 1/10	1/10	1/20	1/40	1/80	1/160	1/320
Proved cases ...	104	0	3.5	21.5	35.5	21.5	18.0	0
Clinical enteric ...	39	5.5	20.0	36.0	15.5	13.0	7.5	2.5
W.R. sera ...	32	15.5	3.5	15.5	34.5	31.0	0	0

(a) There was no titre less than 1/10 in proved cases, while several clinical enteric and W.R. sera were below 1/10.

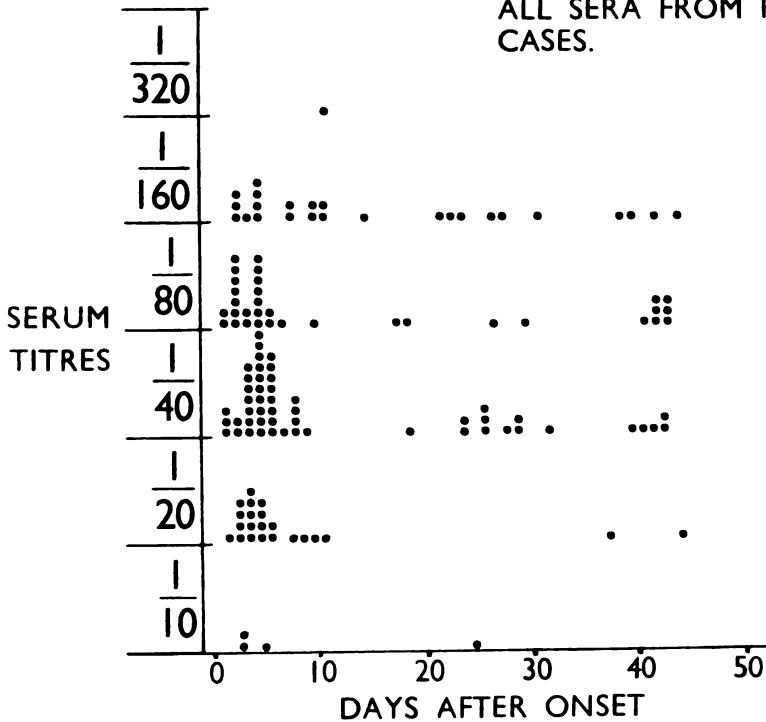
(b) The distribution curve in proved cases shows a peak at 1/40, while the curve of titres in clinical enteric cases is shown to the left with its peak at 1/20.

(c) The highest titre in the W.R. sera was 1/80. This indicates that a single serum titre of 1/160 or more from a suspected case *may* support a diagnosis of paratyphoid B.

(d) No conclusions can be drawn from a serum titre of 1/80 or less in an immunised person during the first two weeks of illness. That is, a patient with a serum titre as low as 1/10 two weeks after onset could nevertheless be suffering from paratyphoid B.

Over-all antibody response in proved cases. Fig. 1 is a scatter diagram in which all the serum titres from proved cases have been plotted against the days after onset on which the sera were taken. The diagram shows no tendency for higher titres to be obtained later in the disease, so that in this outbreak there was, over all, little or no rise in antibody level. Serial antibody determinations on individual patients were not made, but the results of paired serum titrations suggest that in most individuals little or no rise in titre occurred.

FIG. 1: SCATTER DIAGRAM OF ANTI-BO TITRES IN ALL SERA FROM PROVED CASES.



Value of paired sera in retrospective diagnosis. Table 2 shows the presence or absence of a rise in titre in paired sera from proved and clinical enteric cases. All except four of the first sera in each pair were taken in the first week of illness. The second sera were taken at times ranging from two to six weeks after onset. There was no significant difference in the proportions showing a rise in proved and clinical enteric cases. In proved cases only 20 per cent showed a rise of two tubes in titre. If a rise of two tubes or more is taken to indicate infection, 80 per cent of proved cases gave a negative result.

Some of the proved cases showed a fall in titre. The six pairs from proved cases showing such a fall all came from patients who were diagnosed by blood

Table 2. *Alterations in anti-BO titre in paired sera from proved cases and clinical enteric cases.*

Category	Number providing paired sera	No change	One tube rise	Two tubes rise	One tube fall	Two tubes fall
Proved cases ...	44	19 (43%)	10 (23%)	9 (20%)	3 (7%)	3 (7%)
Clinical enteric ...	18	10 (53%)	4 (22%)	2 (11%)	2 (11%)	0 —

culture only, although several stools were examined. Table 3 shows the days on which sera with a fall in titre were taken. Most of the second sera in this table were taken a long time after onset, so that the fall may represent a return to the original antibody level after an initial rise.

Table 3. *Days on which paired sera with a fall in titre were taken.*

Category	Days after onset on which sera were taken		Change in anti-BO titre
	Serum 1	Serum 2	
Proved cases	19	37	Two tubes fall
	5	44	
	3	41	
	6	11	One tube fall
	3	42	
	24	47	
Clinical enteric	5	8	One tube fall
	8	35	

DISCUSSION

The agglutinin titres in this series are similar to those recorded by others. Gardner & Stubington (1932) found anti-O titres of less than 1/400 to a formalised *Salmonella typhi-murium* suspension in 38 of 40 cases of paratyphoid B whose inoculation history was not known. Horgan (1932) found anti-BO titres from 0 to 1/125 one year after inoculation in healthy subjects. Downie & Fairbrother (1934) found anti-BO titres from 0 to 1/2,560 in 23 cases of paratyphoid B who were uninoculated or had been inoculated more than sixteen years previously.

The results presented here suggest that O agglutination with a single serum is of little value in the diagnosis of paratyphoid B. A single titre of 1/160 or more may be suggestive but is nothing more.

Paired sera were almost useless in diagnosis. Only 9 of 44 proved cases showed a four-fold rise in titre. Two of 18 clinical enteric cases had a four-fold rise in titre and might on this evidence have been added after the outbreak to the total of 107 cases proved by bacteriological methods. Fig. 1 might suggest that a more careful timing of serum specimens would give better results, but Mole (1948) found in *serial* Widal tests in typhoid and paratyphoid A in R.A.F. personnel that only 1 of 8 typhoid patients and 3 of 8 paratyphoid A patients showed a four-fold rise in titre. Both he and Dick (1945) concluded that the Widal test is of no value in the recently inoculated. No sera from patients suffering from diseases other than enteric were included in the figures presented here, but Wilson (1945) and others have reported non-specific rises in agglutinins to typhoid O and paratyphoid AO in inoculated subjects with non-enteric infections, though the frequency of a rise in titre was greater in enteric infections. Therefore even a four-fold or greater rise in titre is difficult or impossible to interpret.

The titres in W.R. sera, from personnel most of whom had been inoculated for the first time, or had received a booster dose within the preceding year, indicate a fairly high level of BO agglutinins in the normal military population.

It is impossible to assess the value of prophylactic inoculation from these figures, but it is worth noting that paratyphoid B in the Canal Zone was predominantly of a mild, enteritic type. Raettig (1950) produced evidence in Germany that prophylactic inoculation against paratyphoid B lowered the mortality significantly but had no effect on the morbidity of the disease.

The general mildness of the illness may account for the failure to show a clear-cut secondary response, but whatever the reason these results do not conform to the conventional idea of a rapid rise in anti-O antibodies in T.A.B.-inoculated subjects infected with organisms of the enteric group. Any rise in the first fortnight was very small, as Fig. 1 showed, so that protection appears to come from antibodies present as a result of inoculation and not from a rapid increase in antibody production after infection. This argument assumes that O antibodies detected by agglutination correspond to protective antibodies, an assumption which has not been completely proved.

SUMMARY

The results of paratyphoid BO agglutinations in 107 proved cases of paratyphoid B and 38 "clinical enteric" cases in an infantry unit are presented.

Routine BO agglutination on single or paired sera was of little value in diagnosis in this outbreak.

Cases over all showed little or no rise in antibody levels.

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PHYSIOLOGICAL PROBLEMS OF THE SOLDIER IN TROPICAL WARFARE

AN OPERATIONAL APPROACH

BY

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THE desert and jungle are too well known to warrant description, but their operational aspects have certain physiological implications. Land desert warfare has been, in the main, characterised by fighting vehicles and by mobile infantry in "hard" or "soft" vehicles who rarely march long distances with a pack. Dust and haze impair visibility but glare when a problem is related more to air-strips, roads and vehicles rather than to the desert itself. During the day, cooling the vehicle may be more urgent than cooling the man. Nights are seldom completely dark and hence allow manœuvres. Jungle war, on the other hand, has, in general, been characterised by hidden activities of small isolated groups of men who may have to forgo vehicles and rely on air-drops. Plantations are easy to pass through unless neglected, and the rate of movement by foot may be as rapid as on a fair road. Virgin forest, that is primary jungle, is thick but not always impenetrable and being sheltered is cooler and more pleasant than open country. Visibility may be a matter of ten to fifty yards, and the rate of travel is cut down by half. When primary jungle is cleared and left to itself, a dense overgrowth (secondary jungle) develops at man height through which he must cut a way. The rate of movement is cut down by another half. In swamp areas, progress of a hundred yards or less an hour may be quite an achievement. Added to all this is a hot, damp atmosphere with rain of variable amount. Hills of considerable height may occur in the tropics and are common in jungle areas.

PSYCHO-PHYSIOLOGY OF THE SOLDIER

In times of war the soldier comes in contact with a variety of individuals, not all of whom have to be considered in civilian life: a vicious and implacable enemy, comrades of other nations, his own group of men and officers, and finally, himself, in an unusual role. To know them, and to understand them, is vital.

Evidence to hand suggests that, from the military viewpoint, there are but few important physiological differences between men of different races; however, the men have very different habits, reason differently and, as soldiers, may not always "play the game" by other men's standards. When physiological differences are found (*e.g.* in blood cells or chemistry), they may be related to variation in nutrition or to subclinical infection rather than to race itself (1).

Fear of the sun and of a damp air has for centuries bedevilled the European soldier campaigning in the tropics. "In 1853," said Ranald Martin, physician to

the Bengal Army, "soldiers became terrified of the sun, and the hospitals were overcrowded with men anxious to escape solar exposure." Another physician said later: "Intense fear of disease should disqualify for the tropics . . . they see danger everywhere and imagine every headache a sunstroke." It was, indeed, fear of the sun and the "miasms" arising from damp air which brought in the topee, the spine pad (2) and the cholera belt (3), clothing items characteristic of the British Army for so long. Competent physicians were convinced that they had "proof" of the dangers of being without them, for did not symptoms (headache, weakness, diarrhœa, etc.) disappear when they were used? Similar argument is nowadays put forward for the value of salt in the prophylaxis or treatment of heat disorders, but fear or a fetish may have great power over the physiology of the body. Emotional stress may produce, temporarily, some of the physiological effects of a hot climate—for instance, a rise in body temperature and urinary changes; and functional and organic disease of the frontal cortex, hypothalamus and pituitary gland are sometimes associated with changes in body temperature, blood pressure, blood and urine volume or chemistry, skin changes (dry or sweating skin, rashes resembling prickly heat) and mental disturbances which, to the experienced clinician, are reminiscent of heat disorders. Those with experience of the latter will remember the peculiar overlay of mental symptoms in many cases. How much mental disturbance is a cause and how much a result is not clear; but it is, however, fairly certain that undue fear of the climate in the soldier (or even the medical officer) is not a factor to be lightly dismissed. It is essential not to underestimate the enemy but it is, perhaps, unwise to use the unqualified expression "hostile" environment in front of the uninformed soldier who may tacitly assume that continuous sweating for weeks or months is bad for his health. Problems of family ties and comforts, of boredom, restrictions and dangers have always been the common lot of the soldier; but, with the present trend of war, he may be much more concerned with the safety of his family than of himself. In this context, the fear, sometimes present, that prophylaxis of tropical disease (*e.g.* the use of anti-malaria tablets) is followed by impotence, is not to be forgotten.

APPLIED PHYSIOLOGY OF THE TROPICS

The last war gave ample opportunity of checking the findings of the previous twenty years in the field of tropical physiology. Many of the data were obtained from research carried out in the controlled air (and radiation) conditions of a climatic chamber, and some from the less controlled but realistic environment of the soldier in the tropics or the patient suffering from a heat disorder. Experiments were not always designed to minimise either the large difference between individuals or the naturally occurring time variations (diurnal, day to day, seasonal, etc.) within them. In general, experiments in a climatic chamber are of short duration, being limited by the elemental requirements of food or other demands of nature. The well-fed and fresh subject, exposed to a few hours of muscular work in simulated tropical heat, is also subjected, but for a longer period, to the weather and other uncontrollable variables outside the laboratory.

The term "heat acclimatisation" is used, in general, to designate those changes taking place with heat exposure. There is no doubt that such exposure in a climatic chamber produces many of the changes associated with living in the tropics. However, life in the tropics is more than a question of thermal balance ; for, just as climate modifies the man, so can he modify the terrain and the "climate" of his home or office. He takes with him (or leaves behind) his family ties, habits and social customs. The motorised infantryman of the desert leads quite a different life from a soldier shackled to his pack, Bren gun or wireless set in the jungle.

Artificial conditions in a hot chamber, without desert sunlight, diurnal temperature change, dust and glare, jungle rain, damp clothes, the ration pack, disease-bearing pests, poor sleep and loneliness, can hardly simulate fully the biological, physiological, psychological and clinical problems of either the contented civilian or the harassed soldier in the field. Yet "jungle" and "desert" conditions in the climatic chamber have been assumed to be equivalent because they can, apparently, be equated by the Corrected Effective Temperature and similar indices. Nevertheless the climatic chamber has thrown important light on many facets of heat exposure, particularly the indoor climate of hot industries, hot mines, and aboard ship or plane in the tropics. It is a screening agent for physiological clothing studies, and may help to eliminate the man without sweat glands or the soldier who is psychologically or otherwise unsuited for service in the tropics. The final and appropriate "laboratory" for hot climate physiology is, undoubtedly, not the hot chamber but the tropics themselves.

Insufficient is yet known of the difference in response to heat between the "browned off" man, the anxiety case and the soldier of good morale. Results from the climatic chamber suggest the development of a worth-while level of acclimatisation in a matter of a few days, yet many experienced tropical practitioners have for long insisted that the white man never becomes completely adjusted to living a full life in the tropics. How much more may this apply to the soldier under continuous operational conditions? With a few days of exercise in a hot chamber, there is a decreased rise in pulse rate and body temperature, a quicker response to profuse sweating and an increased sense of well-being to a given work level. The volume of urine decreases (oliguria), as does the excretion of sodium chloride. Such changes, which also occur in healthy soldiers in the tropics or even during a hot season in Europe, are undoubtedly part of a normal compensatory and hormonically induced reabsorption and redistribution of water and crystalloids rather than a simple salt-deficiency dehydration from excess loss in the sweat. Artificial acclimatisation does not appear to affect the resting body temperature on return to the normal environment. However, the resting oral and rectal temperature of fit British soldiers, after several months' service in India, was found to be appreciably higher than in England, reaching commonly between 99.4° and 100° F. in the mouth. No relation was found between body temperature level, the general appearance of the man, pulse rate, "physical fitness" test (Harvard Pack test), level of sweating, blood sedimenta-

tion rate or intensity of prickly heat (4). The "fever," at first glance, suggested heat storage and poor acclimatisation. However, when the same phenomenon was found in equally healthy Indian troops it was obvious that this could hardly be the explanation. Perhaps nature has a "purpose" in slightly raising the "thermostat" level, for the same phenomenon is seen in the camel—an animal certainly adapted to the extremes of hot climates. In Paiforce and India during the last war insufficient knowledge of the normally raised body temperature was a cause of minor but unnecessary manpower wastage brought about by the incarceration of otherwise fit men in hospital or by prolongation of convalescence (4). Whether the hot chamber is of value, or indeed practical, for air-transported replacements who go out without the advantage of a sea journey is not known. To forgo indoctrination and natural acclimatisation after arrival may be hazardous. There is some belief that, during the last war, the Africa Korps were acclimatised in hot chambers in Germany, hardened in Italy, and then flown to Libya. This, however, appears to be a myth. The effect of anxiety, sea sickness or an uncomfortable two- to three-day plane journey on what the body has "learned" in a climatic chamber has also not yet been ascertained.

Clinical dehydration (due to impaired water intake, vomiting or diarrhœa), particularly in the surgical patient, unquestionably predisposes to heat exhaustion and heat stroke; but it is doubtful whether, in spite of theoretical considerations, it is a prime cause. In a hot climate, blood may be exposed for some time to an ambient temperature of 105° F. or more before reaching the laboratory. The resulting swelling of the red corpuscles produces a raised hæmatocrit which may be interpreted as "dehydration" (5). Unpublished work by Major J. H. Bowie, I.M.S., and the author in Paiforce failed to show at autopsy or as a result of histological or hæmatological investigation any definite evidence of dehydration in men or animals in uncomplicated cases of heat stroke. On the other hand, cerebral œdema and gastro-duodenal hæmorrhages are common (with pulmonary œdema in some cases treated by intravenous saline). In fact, the early clinical features suggest acute increased intracranial tension. Typical changes may be present where rectal temperatures during life do not exceed 105° F. There are authenticated cases of men, lost for several days in a hot desert without food or water (and luckily, without salt) who, when found, showed extraordinary shrivelling up of the body (with loss of up to a quarter of their body weight) without the characteristic features of either heat stroke or heat exhaustion, and who recovered fairly rapidly on gradual reintroduction of water and food. Before setting out, such men were filled with highly concentrated morale, but not always with water or salt. It is strange that salt hunger (halophagia) occurs in conditions where there is little evidence of its deficiency; and, except in those who are "salt indoctrinated," is not characteristic of the tropics—either in the indigenous inhabitants, healthy soldiers or patients with heat disorders. A number of infections (lobar pneumonia, typhus and sand-fly fever, etc.), even in the cool season, show many of the clinical and biochemical changes believed to be characteristic of heat exhaustion, again without evidence of salt deficiency. In the absence of such disorders, marked diminution of urinary chlorides (with

or without a low plasma chloride level) is, during the hot season, strongly suggestive of heat exhaustion. Such findings alone are, nevertheless, not proof of salt deficiency, even if symptoms disappear on administration of salt by the mouth. Cases may rapidly improve in a darkened, quiet and cool ward, with mild sedatives but no extra salt. A crucial experiment would be the clinical effect of "salt" which was, in fact, not sodium chloride. It may be added that in the heat stroke centre a low humidity may be more important than a decreased dry bulb temperature.

There is a long history of the dire consequences of heavy work carried out in the heat of the tropical day, particularly by unacclimatised men. The following appeared in a wartime booklet on jungle warfare: "You should be able to: (a) march 20 miles a day for two consecutive days carrying a jungle pack and rifle, without having sore feet, shoulders, legs or back; (b) run one mile on a hot tropical day in your field clothes and boots in less than $7\frac{1}{2}$ minutes, without feeling sick or exhausted afterwards."

Extraordinary feats of escape and endurance were carried out during the Burmese campaign by trained men of extremely high morale. Modern athletic events have shown that the peak of human physical performance has not yet been reached. To obtain this ideal, training and motivation are equally important. For a century or more it has been accepted that under temperate conditions the carriage of loads of more than one-third body weight rapidly leads to deterioration of efficiency (as measured by oxygen utilisation, pulse, body temperature, etc.). Recent work has shown that this is not necessarily true for a fit young man walking for an hour on a treadmill in a cool laboratory. When marching on sand the energy expenditure is appreciably greater than when on a good road, and the energy spent in getting through the jungle even without a loaded pack may be extremely high. Remembering that jungle fighting is the toughest of all schools, it is wiser to assume that requiring the soldier to carry loads over a third of his weight, particularly if he is hungry, thirsty, exhausted by lack of sleep and pestered by unpleasant parasites, can in a short time impair his fighting efficiency and predispose to serious heat disorders. The infantryman on jungle patrol carries a mere 20 pounds, but the usual "marching" load in Malaya today is about 60 pounds, with, for good measure, another 4-5 pounds, as rain, sweat or other source of water. The wireless operator carries yet another 7 pounds, and the No. 1 Bren Gunner a total of about 80 pounds—half his own weight or more (6). Under such heavy strains on the muscles and heat regulating mechanism, the above quoted demands on his marching or running capacity (based, no doubt, on the teaching of Wingate and the exploits of the Chindits) may be too great. Men vary a great deal in height and weight, in physique and response to work and heat; yet the same claims may be made from any of them. The well-known principles of load carriage were put forward by Edmund Parkes almost a century ago, but they have always conflicted with operational requirements. The soldier and the physiologist must somehow work out a solution to this important problem of the soldier's load.

The "Pulheems" system takes into account fitness for service outside

temperate climates, but it is based on broad criteria. During the last war many indices of "physical fitness" of the service man were devised which were derived from physiological measurements (blood pressure, pulse rate decrement, etc.), taken after a fixed period of stepping—or for as long as the man could continue. One of these, the Harvard Pack test, used on British troops in India over a period of several consecutive days, showed a learning factor with a superadded random variation, during which time "fitness" itself was not likely to have changed appreciably. Use of the test during a ration trial on Gurkha troops showed amazing scores (all well over 100 per cent) compared to those of their own British officers (70-85 per cent), who "lost face" as a consequence. However, during the realism of forced marches in the jungle, the officers always came in ahead of their men, whereas stragglers (of very high Pack score) were brought back by truck because of "fatigue" or blisters on the feet. The high score of the small Gurkhas appeared related to their fine calves, for the test is one of rapid step climbing. Since a man cannot be forced to finish the test (five minutes), there is clearly a loophole for the morale factor, and the simple matter of sore feet or backache can produce a temporary low score. Critical work on several of such "fitness" tests did not show a good correlation between them, or between any and a realistic situation (7). There is experimental evidence to show that an experienced officer may be a better assessor of a group of men to take out on a prolonged jungle patrol than any known "fitness" test.

ARMY HEALTH: APPLICATION OF ACCEPTED PRINCIPLES

Equal to or perhaps of greater importance than acclimatising the soldier to sweat easily in the heat is attuning his mind to living and fighting (particularly in small isolated groups) in the desert or jungle. This can be done by indoctrination courses before leaving for abroad. Here he would be taught to respect, but not to fear, a hot climate, and to understand the purpose of his sweat and the changes in the urine. The medical officer should accept that slight "fever," "oliguria," so called "dehydration" and "chloride deficiency," occurring in healthy men in the tropics, are but normal physiological variations. Under present conditions, troops are indoctrinated (and acclimatised) after arrival in excellent jungle schools, and are not sent out on active manœuvres for four to six weeks. The term fatigue is used to cover such a multitude of conditions that one might well ask at the outset—fatigue for what? Tropical fatigue (formerly tropical neurasthenia or "Burma head," etc.) covers a number of overlapping entities related to prickly heat (viz., thermogenic anidrosis) or to heat exhaustion, but some are of a primary anxiety nature. Because of the greater, more varied and unrelenting demands on the individual soldier and junior commander in jungle warfare, tropical fatigue occurs much more frequently than in the desert. The "browned off" man probably acclimatises badly and may be liable to any heat disorder. Because his personal hygiene is poor, he is also a candidate for any type of environmental "trauma," including tropical infection.

It is, perhaps, inevitable that the skin—the part of the body in closest contact with a tropical environment—should be the sensory organ from which heat

acclimatisation and, perhaps, its failure take place. For this reason much attention should be paid to its hygiene. A good tan is a rational start to continuous tropical exposure ; it may prevent over-sweating but is, apparently, no guarantee against prickly heat. Two cold showers a day whilst in base camp, and one or two wash-downs a day in the jungle, act as a sedative to the continually stimulated skin and are prophylaxis against prickly heat and heat disorders. Prickly heat (to which no race is immune) is an annoyance under any conditions, but in the jungle are to be added flies and the nauseating blood-filled leech during the day and the mosquito, mite and tick at night. The use of chemical insecticides is now widespread, but the long-term effect on the man and the possibility of producing "acclimatised" pests is not to be lost sight of. It is probably the "jungle" microclimate at skin level which encourages not only the fungi causing "foot rot" and "dhobie itch" of the groin, but also the bacteria associated with boils, infected bites and abrasions. In some individuals under ordinary conditions, such organisms appear to live as harmless saprophytes. The boiling of unshrinkable socks and underwear—a no mean task for the soldier at any time—has been suggested as a preventative, but this treatment can hardly be applied to the feet, or even to the boots. Friction due to any cause—clothing, web equipment—may initiate skin infection or prickly heat. Skin disorders, which form a high percentage of casualties in hot damp climates, are hardly to be diminished by the use of towels which are rarely clean or dry. Water is, usually, abundant in the jungle, but it may be infected. It is, furthermore, not clear whether frequent washing in cold or hot water, with or without soap, will decrease skin disorders. Exposure to chemical warfare agents may necessitate the use of sweat-inhibiting drugs with the consequent impairment of heat loss.

Exposure to a hot climate is believed to modify the normal microscopic flora of the bowel. This, together with unusual food (including extra salt), unsuitable drinks (including large quantities of cold water) and varied psychological factors, may explain a number of cases of minor abdominal pain and diarrhœa. Heat stroke and exhaustion on occasion present themselves as diarrhœa or vomiting ; but infection is the most important cause of prolonged bowel disturbance. Although it is supposed that in a hot climate men have a smaller appetite, especially for protein, the British soldier appears to carry his normal dietary habits with him everywhere. Fit soldiers on manœuvres can remain efficient for a few days on a low calorie diet if this is followed by a week of first-class rations to "fill up" again. Palatability and variability of a ration are important factors, but in the jungle, where a man may have to carry on his back food for five days, weight becomes a serious consideration. Dehydrated foods may be the answer. Living off the land is only a practical proposition for specialised troops.

A "drill" for drinking water is laid down in medical and training pamphlets and cannot be improved upon. It must be accepted that the man acclimated to the heat cannot be adapted to drink less than that required by thirst. However, one can hardly do more than encourage him to drink as much as he wishes—if, of course, plenty of palatable water is available. For the battle casualty and for

chemical warfare decontamination, speed in getting to the water-bottle may be vital. In any case the water-bottle may be the final arbiter of what he can actually get to slake his thirst. It is still widely believed that an increased intake of salt is necessary for the health of the soldier in the tropics, but the evidence is not always convincing. Salt in the form of the uncrushable tablets of the last war, or even dilute tepid saline, may induce nausea or vomiting and diarrhoea in some men and aggravate prickly heat in others. In any case, salt is thirst-producing and thus a drain on the water supply. The last word on this controversial matter has not yet been said.

Rest for the soldier may be considered under (a) that associated with continuous activity—marching or digging—and requiring, in the tropics, five or ten minutes' rest every half-hour or less, (b) diurnal rest—or sleep—and (c) periodic rest and leave. Night, in both desert and jungle, is an important time for action and patrol. In the hills and many desert areas the night is appreciably cooler than the day. The change soothes the sweating skin and is conducive to sleep. Sand makes a good bed. For the infantryman in the jungle, the extreme fatigue of the day's activities, coupled with the long nights and with the discomfort arising from skin disorders, may make sleep difficult. In the damp atmosphere, the action of the usual mosquito repellent wears off in three hours, and the man awakes to repeat the treatment and then get off to sleep again. Head and hand nets are too uncomfortable to wear for sleep, but may be necessary for night patrols. Because of the damp soil and the affinity of the typhus-bearing mite for human skin, the soldier should not sleep on the jungle floor. Some acclimatisation is required to sleep comfortably in a hammock or a platform of saplings. For many reasons it may be necessary to "dig-in." Prolonged activity of small groups of men produce particular strain on the junior officer, and more data are required on the maximum periods that soldiers should spend in a fighting zone and elsewhere. It is, furthermore, not sufficient to have leave centres. Steps should be taken to ensure they are fully used.

Long exposure to desert heat and to abrasion by sand dries the skin and the membranes of the eyes (emery-cloth eyes), mouth (peeling of mouth and tongue), ears and nose, but, ordinarily, this is not a great problem. The ultra-violet light reflected from sand and stone, and the intensity of "glare," are not such as to necessitate sun-glasses for the ordinary infantryman, but these may be necessary after administration of atropine. The headgear should have a good peak. For night vision to be at its optimum, a man should wear tinted lenses (particularly red) during daylight hours. With long periods of driving it may be sufficient to give a coat of green paint to the top of the windscreen, but with exposure to wind or sand, especially in convoy, efficient all-purpose goggles are required (with untinted lenses for night). A piece of cloth or handkerchief is sufficient protection for the nose. Ordinary tinted glass (or perspex) lenses are no safeguard against the direct sun exposure (retinal burn) of sky-scanning, and will give no protection against the much greater atomic flash at distances where the man is otherwise unhurt. There is no way out of the mirage phenomenon. Jungle fighting by day is reminiscent of night operations, for light intensity is low and

visibility limited. The soldier must rapidly develop the jungle eye—look through and ahead—and easily recognise hand signals. Smell sensation may be important. It is the ear, however, which becomes the important sense organ for the man must learn to listen, to discriminate natural and code sounds, and to use the whispered voice effectively. The ear should be protected from loud noises of gun fire but otherwise uncovered by headgear. In a climatic chamber, a high Corrected Effective Temperature (80° F. or more) is said to impair the efficiency of psycho-motor tasks, and the same may be true of field conditions. In a fighting vehicle (with its “wild” armament fumes and heat) or in the radar or other control truck, the man may be much worse off inside than he is in the open. It may sometimes be necessary to introduce means of ventilating either the vehicle or the man.

CLOTHING AND EQUIPMENT

For physiological evaluation, the soldier's clothing (normal and protective) and all his personal equipment are to be regarded as one. Clothing for the tropics should be streamlined, light, loose, absorptive and freely permeable to sweat and water vapour. Sweat retained at skin level will predispose to prickly heat. It is doubtful if there is any particular virtue in linen for a hot climate and, colour apart, there is little physiological difference of practical importance between garments required for jungle or desert. The problem of damp clothes in the jungle is not easy to answer, and dry spare garments must be carried by the man for wear at night. Heavy rain is best kept off by a separate light and very loose impermeable cape. A white cloth will be efficient in reflecting solar heat (or atomic flash), but like a metallic surface has camouflage and near infra-red detection disadvantages. The most suitable colour is some variant of well-tried khaki. Many surface treatments of fabrics (anti-flame, water- and insect-repellant etc. treatments) add little to heat load of garments. Starching, however, tends to close air interstices, makes the material harsh, and, in the hands of the local “dhobie,” may be a possible source of fungus infection.

The question of one- versus a two-piece garment for the tropics is frequently raised, but the better ventilation of the latter may be neutralised by a belt round the waist and the equipment on the back. Nevertheless, the soldiers' belt has, in the past, supported the load, suspended the trousers and, perhaps, subconsciously raised his morale. The advantages of removing clothing from the chest, and the demands of nature, make the one-piece garment impracticable for the soldier. For similar reasons a bush-jacket may lose its advantages under operational conditions. The flame-proofing of cotton has, up to the present, a number of practical disadvantages, and for many reasons (including A.W. requirements) it may be wise at present to stick to the well-tried long-sleeved “woollen” shirt (but of pure wool) for tropical warfare. Men of the British Army are issued in the tropics with vest and drawers, but the former does not appear to be popular. Although objective physiological proof of the value of the Brynje or string vest (for hot or cold conditions) has never been forthcoming, recent trials have shown that a soft garment of this sort might add to comfort in

the tropics and, as a "spacer," protect against atomic radiant heat. There is no agreement as to the value of drawers, but in the presence of prickly heat or skin infection (and with the possibility of diarrhœa), they help to keep the dirty or infected trousers off the skin. Underclothes are also more likely to be frequently washed. Friction in the buttocks, may, perhaps, be minimised by elimination of the back seam of drawers. It is considered that continuous filament non-absorptive nylon or terylene is not suited for tropical underclothing. Shorts are traditional in the British Army, but if used should be wide as formerly worn by officers of the Indian Army. They are not worn on jungle manœuvres, for the skin must be protected against mechanical injuries, thorns, leeches and insects. In future warfare their use may be prohibited. The soldier requires a "cool head" but for this a topee is no longer necessary.

Footgear should protect against hot ground of the desert and the entry of leeches in the jungle. Because a pound on the sole is equivalent to two to three pounds on the back, the weight of a boot must be a consideration (8). A considerable body of data shows that the virtue of leather lies in its ability to take up sweat rather than its so-called ability to "breathe," that is to allow skin water vapour to pass out. On the other hand, leather absorbs water from without and rapidly deteriorates in the jungle. Preliminary trials have shown that the "improved G.S. boots" (pre-moulded composition soles and leak-proof) are both warmer in the cold and cooler in the desert than the conventional G.S. item. This is due, apparently, to the removable "ventilating" insole. It appears that neither an impermeable sole nor unshrinkable, sterilisable socks of 100 per cent nylon or terylene (of the same colour and weave as the G.S. socks) decreased foot comfort or increased "foot-rot" in men marching in the desert during a several weeks' trial. The present canvas jungle boot would be improved by being modified to take a removable insole. Whenever possible men should get their feet washed, dried and powdered and put into a good sandal or "chapli." This may be a useful prophylaxis against fungus infection. Men are no longer punished for not wearing a topee, but it is disquieting that the British soldier has sometimes preferred the beret, cap comforter, or jungle hat to the ballistic protection of a steel helmet. There are three factors to be considered; the morale value of the beret, the likelihood of being hit, and the discomfort and other disadvantages of an unstable steel helmet—particularly in the jungle. The combination of regional lightweight armour with the load carriage equipment has its possibilities. Completely impermeable garments will be necessary for chemical warfare protection or for men working with toxic propellants, etc., under tropical conditions. The necessary cooling may be obtained by an added wetted porous exterior or by artificial ventilation using cooled or dried ambient air.

CONCLUSION

Physiology and personal hygiene of hot climates are to be considered in relationship to the ecological and operational environments in which the soldier finds himself. There is a blurred zone between the physiology and psychology of

tropical exposure, and between these and heat disorders. The relative value of artificial acclimatisation and indoctrination is worthy of study. The present attitude to drinking water cannot be improved, and no longer are salt tablets administered as a drill. Extra salt is probably no guarantee against heat disorders and may in some men aggravate prickly heat. More important than extra salt are good personal hygiene and high morale. Research on tropical clothing is continuing, but serious thought should be given to the weight of the infantry jungle load. If past lessons are not to be forgotten, a still closer link must be maintained between the disciplines of Army Health, Applied Physiology, Service Psychology and Military Medicine.

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INCIDENCE OF ABNORMALITIES OF THE TOE CLEFTS AMONG BRITISH TROOPS IN MALAYA

BY

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DURING the period October, 1956 to July, 1957, a random sample of 1,000 men were inspected for abnormalities of the toe clefts. These included scaling, maceration, fissuring and vesicle formation, either singly or in association. The term *tinea pedis* cannot correctly be used, as microscopic confirmation of the presence of fungus could not be made under the circumstances. The lesions were, however, situated in what could be regarded as likely sites of fungus infection, and this would no doubt have been confirmed in many cases had the examination of scrapings been practicable.

The sample was composed as follows :

R.A.C.	...	...	...	...	...	...	...	204
Infantry and airborne troops	...	...	...	...	...	...	...	478
Others (R. Sigs., R.A.S.C., R.A.M.C., R.A.O.C., etc.)	...	...	...	...	...	...	...	318

The first two groups consisted of operational troops, the R.A.C. being employed mainly on convoy and escort duty on roads, the infantry and airborne troops operating in the jungle on patrols and ambushes. The remainder were non-operational personnel employed in base units and headquarters.

The following details were recorded in relation to each man: age, hair colouring, length of service in Malaya, and condition of feet, which included presence or absence of hyperidrosis, scaling and maceration of skin, fissuring and eczematization, with some indication of the degree involved. The men were seen lying on their beds, covered only by a towel, in a reasonably good light. In this way evidence of body or crural tinea could be seen in addition.

Of the total number inspected, 424 (42 per cent) had abnormal toe clefts to a varying degree, the remaining 576 (58 per cent) being clear. Of these 576 men, 213 had been successfully treated for presumed tinea pedis in the past; 47 showed evidence of active tinea elsewhere, chiefly on the body and crutch, 35 of these cases being associated with concurrent foot lesions.

Age. Of the men inspected, 683 were 18 to 20 years old, and 317 were 21 and over. Age bore no relationship to the presence of lesions. It was noted, however, that there was a significant drop in the percentage of hyperidrotics among the older age groups (see Table 1).

Table 1. *Association of age with hyperidrosis*

Age group	Number hyperidrotic	Number with normal skin	Total
Under 21 and over 18 ...	295 (43.2%)	388 (56.8%)	683
Over 21	108 (34.1%)	209 (65.9%)	317
Total	403 (40.3%)	597 (59.7%)	1,000

Difference = 9.1%

SE = 3.2

Difference $> 2 \times \text{SE}$ \therefore significant

Type of Employment. The type of employment, *i.e.* whether operational or not, bore no apparent relationship to the incidence of abnormal toe clefts, there being no significant difference between the R.A.C. (43 per cent), infantry (44 per cent) and non-operational troops (40 per cent) (see Table 2).

Table 2. *Incidence of lesions among different categories of troops.*

Arm	Number showing lesions	Number free from lesions	Total
R.A.C.	89 (43.6%)	115 (56.4%)	204
Infantry	208 (43.5%)	270 (56.5%)	478
Others (non-operational)	127 (39.9%)	191 (60.1%)	318
Total	424 (42.4%)	576 (57.8%)	1,000

Difference between operational and non-operational troops = 3.6%

SE = 3.3

\therefore Difference not significant

Colouring. 356 men were fair haired, 214 dark, and the remaining 430 classified as medium. Although the percentage of lesions appeared to be highest in the fair haired and lowest in the dark haired, the difference proved not to be significant. The incidence of hyperidrosis, however, bore a definite relationship to hair colouring, the incidence among fair (44 per cent) and medium (42 per cent) being significantly higher than among the dark haired groups (see Table 3).

Table 3. *Association of hair colouring with hyperidrosis*

	Total	Number hyperidrotic	Number with normal skin
Fair and medium ...	786	335 (42.6%)	451 (57.4%)
Dark	214	68 (31.8%)	146 (68.2%)
Total	1,000	403 (40.3%)	597 (59.7%)

Difference = 10.8%

SE = 3.4

Difference $> 2 \times \text{SE}$ \therefore significant

Length of service in Malaya. Although the percentage of cases showing lesions appeared to reach a peak in the 6 to 9 months group, and again among the over 18 months group, the differences between these and the groups showing the lowest incidence were not significant (see Table 4).

Table 4. *Length of service in Malaya in relation to incidence of toe cleft abnormality.*

Months service in Malaya	Number with lesions	Number without lesions	Total	Percentage with lesions
0-	67	107	171	39 _x
3-	60	79	139	43
6-	70	78	148	47 _y
9-	60	74	134	45
12-	73	105	178	41
15-	30	64	94	32
18 +	64	72	136	47
Total	424	576	1,000	42

Difference between x and $y = 8$ SE = 5.8 \therefore not significant

Hyperidrosis. The criteria for hyperidrosis were personal history and palpable clamminess of the palms and soles, the men being quite prepared to admit whether or not their feet were habitually sweaty. Occasionally it was difficult to distinguish between normal sweating on account of the climate and neurogenic hyperidrosis, but the decision could usually be based on the above criteria. Of the total number seen, 403 (40 per cent) were noted to have hyperidrosis of the palms and soles of neurogenic type, the remaining 597 (60 per cent) having a normal skin; 208 (51.6 per cent) of those with hyperidrosis showed lesions compared with 216 (36.2 per cent) of those having normal skin, the difference being significant (see Table 5). The relationship between hyperidrosis and age (Table 1) and hair colouring (Table 3) has already been pointed out.

Table 5. *Association of hyperidrosis with incidence of lesions*

	Total	Number showing lesions	Number free from lesions
Hyperidrotic ...	403	208 (51.6%)	195 (48.4%)
Normal skin ...	597	216 (36.2%)	381 (63.8%)
Total ...	1,000	424 (42.4%)	576 (57.6%)

Difference = 15.4%

SE = 3.1

Difference $> 2 \times \text{SE}$ \therefore significant

Table 6 gives a further breakdown of the incidence of lesions among hyperidrotics of different age groups in comparison with the incidence among similar groups with normal skin. Although this shows a steady decrease in hyperidrosis with increase of age, it also shows a marked increase in the incidence of lesions among the older age groups in which hyperidrosis persists. This indicates that hyperidrosis encourages the persistence of skin lesions either by aiding the underlying cause, or by preventing its eradication, in spite of treatment.

Table 6. *Incidence of lesions among hyperidrotics and normals aged 18 to 24+.*

Age	Total	Hyperidrotic	Number with lesions	Normal skin	Number with lesions
18	61	30 (49%)	13 (43%)	31 (51%)	11 (35%)
19	350	164 (47%)	93 (57%)	186 (53%)	60 (32.2%)
20	272	101 (37%)	41 (41%)	171 (63%)	61 (36%)
21	212	79 (37%)	44 (56%)	133 (63%)	52 (39%)
24+	105	29 (28%)	17 (59%)	76 (72%)	32 (42%)
Total	1,000	403 (40%)	208 (52%)	597 (60%)	216 (36%)

Degree of abnormality. The types of lesion observed and the degree of abnormality are summarised in Table 7.

Table 7. *Types of lesion.*

	Associated with hyperidrosis	Associated with normal skin	Bilateral	Unilateral	Total	Percentage
Eczema fissuring and maceration	5	3	7	1	8	2
Eczema and fissuring ...	1	3	1	3	4	1
Eczema and maceration ...	10	7	12	5	17	4
Fissuring and maceration ...	22	27	29	20	49	11
Maceration only	150	160	222	88	310	73
Fissuring only ...	14	10	9	15	24	6
Eczematization only ...	6	6	5	7	12	3
Total ...	208	216	285	139	424	
Percentage ...	49	51	67	33		100

Of the cases where scaling and maceration were present, the number of toe clefts involved was as follows :

One	...	...	...	...	26 per cent
Two	...	...	...	...	41 per cent
Three and more	...	...	...	...	33 per cent

Sixty-seven per cent of all cases showed bilateral abnormality. In the remaining 33 per cent lesions were limited to one foot.

The incidence of maceration among hyperidrotics (46 per cent) was significantly higher than among those with normal skin (33 per cent), and the incidence of fissuring among hyperidrotics (10 per cent) was also just significantly higher than among the normal (7 per cent).

SUMMARY AND CONCLUSIONS

Forty-two per cent of a random sample of soldiers showed abnormalities of the skin of the toe clefts. This sample consisted solely of men employed on normal duties with their units and did not include those who were in hospital at the time with skin lesions. The exact cause could not be determined through lack of microscopical facilities, but these lesions were regarded as likely to harbour a fungus. Hyperidrosis occurred in 40 per cent, being found more commonly among the younger men and less commonly among the dark haired. The type of employment, *i.e.* operational or non-operational, had no significant influence on incidence, but lesions were significantly more common among hyperidrotics. Hyperidrosis therefore appears to be a predisposing cause of such abnormalities, and the necessity for maintaining a dry skin is made apparent as an important control measure for this complaint. The use of foot powder and the exposure of the feet to the air as much as possible as important items of personal hygiene must therefore be stressed. The need for such measures is seemingly greater among the young and the fair haired. As age increases, although the incidence of hyperidrosis drops, the incidence of lesions among hyperidrotics steadily increases, indicating that hyperidrosis favours the persistence of skin lesions either by encouraging whatever underlying cause there may be, or by preventing complete eradication after treatment. The suitability for service in tropical climates of the grosser cases of neurogenic hyperidrosis is open to question, and it is considered that for such cases a PULHEEMS Employment Standard of FT (*i.e.* fitness to serve in forward areas in temperate climate only) rather than FE (*i.e.* fitness for service in forward areas in all types of climate) would be more appropriate.

Editorial

SOME RECENT DEVELOPMENTS IN IMMUNISATION PROCEDURES

INTERFERENCE with mobilisation programmes by inoculation—or vaccination as it is now called—must be cut to a minimum, and in recent years Army pathologists have been investigating ways and means of reducing the inconvenience and possible hazards of these procedures by using modified techniques. The multiple pressure method for vaccination against smallpox, which was introduced some ten years ago, led the way.

For anti-enteric vaccination the subcutaneous route has been used since the earliest days, and the local and systemic reactions associated with this method have caused much concern. The problem has assumed greater importance recently with the possible need to mobilise men fit for active service in the shortest possible time.

Reports emanating from the United States, Malaya and India have indicated for some years that reactions are much reduced when the intradermal route is used, though doubt has persisted regarding its comparative efficacy, especially for primary immunisation. For us in the British Army, however, the adoption of this method was precluded because, when first mooted and until 1952, an alcoholised vaccine was in use which could not be injected into the skin. Then when we reverted to a phenolised product the position was complicated by the combination of tetanus toxoid with the vaccine.

Even so the intradermal method was studied in the laboratory along with other methods designed not only to minimise reactions but also to eliminate if possible the use of syringes in order to reduce the danger of cross infection in mass vaccination. These included a scratch technique and the use of multipuncture instruments on the model of the Heaf gun.

Investigation of the scratch method for T.A.B. was soon abandoned, and although the use of multipuncture instruments showed early promise using monovalent salmonella vaccines, these too proved a failure when applied to T.A.B. The solution of the problem became a matter of urgency in 1956 at the time of the Suez crisis when large numbers of men called up for the emergency required booster doses of T.A.B. and the risk of undue reactions was unacceptable. It was therefore decided to adopt the intradermal route for boosting on the basis of Luippold's (1) observations in the United States and studies in the field by Rosenoer (2) and Holt (3) of our Corps, which had shown virtually no reactions using this technique.

This innovation was well received by all concerned, and it was decided to intensify investigations with a view to extending this method to *primary* immunisation not only against enteric but also against tetanus, using a combined T.A.B.T. prophylactic.

This work was carried out in conjunction with the Wellcome laboratories,

who studied the tetanus aspects, and the Royal Air Force, who provided the volunteers and did the vaccinations and bleedings. The results have since been published in the *Lancet* (4), and on the basis of the observations reported there T.A.B.T. for intradermal use was introduced into the Army at home early this year. Since then the only reactions which have been reported have been local, and followed vaccination in the forearm and not in the site of election, which is behind the posterior border of the distal portion of the deltoid muscle. One or two people known to react to T.A.B. have complained, but said that the upset was less severe than with the subcutaneous method.

This measure has cut down delays due to immunisation and therefore in the time required to prepare men to move, since in an emergency practically all those vaccinated in the afternoon are fit for normal duties next day. It is felt that this in itself has justified its introduction, although the method is a little more tedious and probably more time-consuming in the actual vaccination procedure. There are some hopes, however, that a needleless injector may become a practical proposition in the future, though at present the machine is expensive and not reliable in delivering an accurate dose intradermally.

Information regarding the stability of the intradermal vaccine is incomplete, therefore its use is at present confined to the United Kingdom. If, as seems likely, the new vaccine proves to be no less stable than the old, its use will be extended.

Another measure recently introduced in order to reduce vaccinations affects the older age groups. It has been decided that individuals who have received the first three doses of T.A.B. and such further maintenance doses as are required up to the age of thirty-five need not be given further maintenance doses thereafter except in the presence of a major risk.

So much for T.A.B.T. In Lagos Captain Meers of the Royal Army Medical Corps has been participating in trials of the scratch method for yellow fever vaccination. This method was shown to be effective some twenty years ago using the French neurotropic virus, and was originally evolved as a safe and simple procedure to raise the immunity of large populations at risk in under-developed areas. It was not intended to replace immunisation for purposes of international travel, with which the services are primarily concerned, as it did not produce the high percentage of conversions from non-immune to immune required to meet the regulations.

Later, Hahn (5) successfully introduced the scratch technique using the virus known as 17D grown in the developing chick embryo. This variant was originally isolated from a patient suffering from a mild attack of yellow fever, and subsequently passaged in tissue culture. Vaccine prepared from the 17D virus grown in mouse brain was recently shown to be as effective as the chick embryo 17D vaccine when given by the scratch technique, 85 ± 5 per cent of persons being protected (6). Now it has been demonstrated that 98 per cent of non-immunes become immune following two scratches separated by 14 days (7). This meets the suggested requirements for the recognition of the scratch method for international travel. The procedure is speeded up considerably, and Meers

found that a team of two vaccinators could easily compete with a team of three using the conventional method.

This work was done using a 17D mouse brain vaccine as it is cheaper and more readily available. This material is not acceptable for the Army, but, if the results can be confirmed with a chick embryo vaccine using a shorter interval between scratches, or if a single set of scratches prove sufficiently effective, we have a safe, cheap and rapid method for yellow fever vaccination. Safe, because no syringes are required; cheap, for the same reason and because a cruder vaccine may be used, and quick because the method is simple and can be carried out by fewer and less skilled personnel.

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THE FIRST D.S.O.

THIS number contains an account of the chequered early history of the Army Medical Services, written by an acknowledged authority on military history and battle honours. In his latest book entitled *British Orders and Awards*,* Major Lawrence L. Gordon recounts the whole story of British orders, medals and other decorations of which members of our Corps have garnered their full share. Major Gordon pays tribute to the brilliant record of the Royal Army Medical Corps, and refers to their unique position with regard to the award of the Victoria Cross. What may not be so well known is that a medical officer, Deputy Surgeon-General Stewart Lithgow, was the first officer to receive the Distinguished Service Order after its institution in 1866.

Book Reviews

BASIC SURGERY. Edited by Leslie Oliver, M.B., F.R.C.S. London: H. K. Lewis & Co. Ltd. 1958. Pp. 1,360+xvi. Illustrated. £6 6s.

According to the publishers' notice, this book has been written primarily for undergraduate students, but in the reviewer's opinion it will be appreciated by postgraduates who wish to keep up to date in lately consolidated surgical knowledge in some of its main branches.

Surgeons, each with special experience in his own field, have written sections on abdominal, pædiatric, genito-urinary, thoracic and neurological surgery. Other sections deal with maxillo-facial conditions, the neck and the surgery of the endocrine glands. Orthopædic and peripheral vascular problems are also dealt with competently. Valuable recent information given in brief sections on

*Printed privately. Obtainable from the author at his address, Audmore, Gnosall, Nr. Stafford, Price 34s. 6d.

reactions to injury, blood transfusion, antibiotic therapy, surgery in diabetes and radiotherapy related to surgery, conclude the book.

An attractive feature is that the investigation and management of important and relatively common problems receive more attention than rarer entities of traditional textbook interest. The frequently better prognoses due to altered social conditions, antibiotics and advances in surgery come out well.

This book presumes some previous knowledge of surgical pathology and the elements of systematic surgery so that space has been saved for a fuller description of the advances gained over the past two decades. Operative details including some useful hints, helpful even to the experienced surgeon, are described. The illustrations and diagrams augment the text, which is clear, avoids verbosity and is very readable.

The editor and his collaborators as well as the publishers are to be congratulated on the production of a 1958 vintage surgical textbook which should prove helpful to a wide range of readers, but the price and size of this book are both too heavy. Not all medical students or post-graduates are subsidised financially by grants and surgical textbooks become outdated. Would it be impossible to publish a cheap edition in multiple parts with paper back covers as is done by many publishers of popular history, science and fiction? J. H.

A SYNOPSIS OF HYGIENE (Jameson & Parkinson) (11th Edition). Llywelyn Roberts, M.D., M.R.C.P., D.P.H., assisted by Kathleen Shaw, M.B.E. London : J. A. Churchill Ltd. 1958. Pp. 694+viii. Illustrated. £3.

Jameson and Parkinson has been given a new look ! When Dr. Roberts took over the 10th edition he obviously did so with some diffidence. This 11th edition bears his stamp more firmly in that considerable change has been made where it was needed without loss of identity. The volume is slightly slimmer by reason of larger pages and (regrettably) smaller print. The historical introductory section is little changed and this is, for obvious reasons, true of the sections dealing with Water Supplies, Removal and Treatment of Waste Matters and Sites and Building Construction. But other sections reveal radical change and have been given more precise titles. This is most noticeable in dealing with communicable disease and the care of mother and child. The section on Public Health Law is brought up to date by a précis of the Clean Air Act, 1956, and of the two Consolidating Acts, Food and Drugs Act, 1955, and the Housing Acts, 1957. The old appendices (except for the D.P.H. Rules) have been dropped in favour of a useful list of services, particularly voluntary associations, working in the public health field ; and by an appendix on occupational mortality. Finally a separate index to Acts and Regulations referred to in the text is now supplied. This is still a standard and compendious reference book, but it is also truly a *new* edition. D. H. D. B.

AN INTRODUCTION TO GENERAL PRACTICE. D. Craddock, M.B., Ch.B., D.Obst., R.C.O.G. London : H. K. Lewis & Co. Pp. 584+xv. 42s.

The publication of a second edition only five years after the first proves the

need for an up-to-date work in this extensive field. The foreword by Sir Heneage Ogilvie is unchanged, its vigour refreshing, the comments still topical.

In the book itself written by a G.P. *for* G.P.s., the outlook is humane, skilled and practical ; of particular interest to young doctors (and others) is the domestic treatment and management of many conditions where hospitalisation is not required or perhaps desired. This important angle, for which teaching hospitals are not always the best apprenticeship, is completely covered and the author's claim of "some reference to all conditions which the average general practitioner sees once a year" difficult to refute.

The scope of the book is well revealed by a few typical chapter-headings ; "The patient with no organic disease," "Minor surgery," "Problems of life and death," "Drugs and potions," "The doctor and the law." References are provided for those seeking more detailed information and there is a good index.

This book is strongly recommended to the general practitioner. D. P. B.

A MANUAL OF ANÆSTHETIC TECHNIQUES. William J. Pryor, M.B. (N.Z.), F.F.A.R.C.S. (Eng.), D.A. (Eng.). Bristol : John Wright & Son Ltd. (2nd Edition) 1959. Pp. 228+viii. Illustrated. 27s. 6d.

This small book on anæsthetic techniques contains a wealth of information and sound advice for trainees in anæsthetics. Competence in the technical aspects of anæsthesia can only be acquired by long practice and experience, but Dr. Pryor has provided in this manual a detailed and comprehensive guide to the modern practice of anæsthesia for a very full range of surgical procedures in all age groups.

He covers the subject superficially but widely, including chapters on equipment, physiology, pharmacology, resuscitation and the explosion risk, and he stresses the hazards, difficulties and complications associated with the practice of anæsthesia.

While the text is lucid and eminently readable, it seems a pity that, in a practical manual such as this, there are not more illustrations to support it. It will seem remarkable, too, to many anæsthetists that, although the publication date of this second edition is as recent as January, 1959, only passing reference is made to the use of Halothane for general anæsthesia.

There is little doubt that this book will prove useful to those learning the art and science of anæsthesia.

K. F. S.

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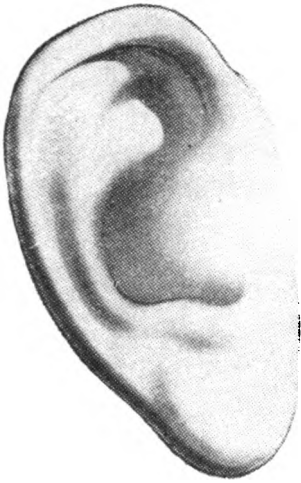
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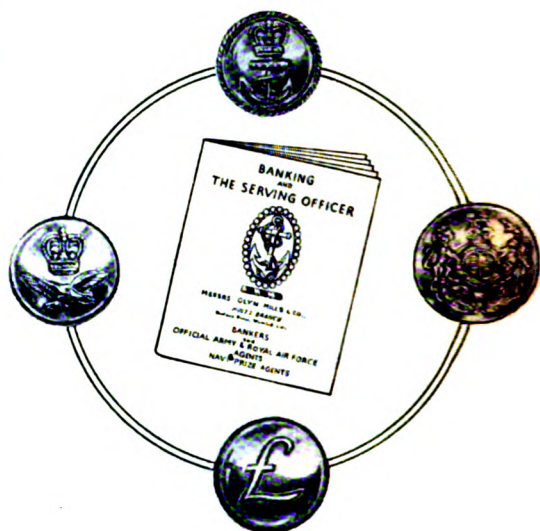
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INDEX TO VOLUME 105

	PAGE		PAGE
Abnormalities of the Toe Clefts among British Troops in Malaya, The Incidence of—F. J. Ingham and T. A. G. Reed	182	Dowling, M. A. C. and H. E. Webb—A Preliminary Report on Encephalitic Type of Illnesses in Singapore	28
Adamson, P. G.—Geriatrics in the Army—Report of a Case	159	Dowling, M. A. C. and R. D. Hughes—Malaria Control by Residual Spraying Reinforced by Short-Term Chemoprophylaxis	61
Ainslie, J. F.—Schistosomiasis Amongst Rhodesian Troops	131	Eastern Command Physical Training School, A Survey of Hæmoglobin Levels of Students attending the—P. R. Holt	13
Ambulance Légère—J. C. Watts	111	Editorial—Some Recent Developments in Immunisation Procedures	187
Anæsthetic, A Hazardous—C. M. Campbell	135	Encephalitic Type of Illnesses in Singapore, A Preliminary Report on—M. A. C. Dowling and H. E. Webb	28
Army, Geriatrics in the—Report of a Case—P. B. Adamson	159	Epidemiological Features of Malayan Leptospirosis—R. W. Ross Russell	17
Army Medical Services, The—L. L. Gordon	145	Exercise "Medical Meilanion"—F. M. Richardson	49
Bacillary Dysentery in an Isolated Army Establishment, An Outbreak of—J. D. Leece	164	Femur, A Case of Bilateral Supracondylar Fracture of the—A. P. Dignan and D. J. Reid	25
Barnsley, R. E.—The First Field Dressing Base, Morale at the—Neville C. Oswald	85	Field Dressing, The First—R. E. Barnsley	85
Bilateral Supracondylar Fracture of the Femur, A Case of—A. P. Dignan and D. J. Reid	25	Field, T. E., P. J. Scheuer and C. R. Tribe—Hæmoglobin Levels and Helminthiasis in Malay Recruits	113
BO Agglutinin Levels in Paratyphoid B Fevers, Salmonella Paratyphi—J. F. Watkins	167	First Field Dressing, The—R. E. Barnsley	85
Brumfitt, W. and P. L. Masters—The Use of Selective Media for the Detection of Beta-Hæmolytic Streptococci	38	Food Poisoning, An Outbreak of <i>Clostridium Welchii</i> Toxin—J. G. P. Power and H. Lister	71
Campbell, C. M.—A Hazardous Anæsthetic	135	Fraser, Francis—The Practice of Medicine: Past, Present and Future	1
Carriett, G. H.—A Case of Surgical Emphysema Following Dental Extraction	84	Geriatrics in the Army—Report of a Case—P. B. Adamson	159
Case of Bilateral Supracondylar Fracture of the Femur, A—A. P. Dignan and D. J. Reid	25	Gill, D.—Some Clinical Features of Ringworm in Malaya and Hong Kong	120
Case of Surgical Emphysema Following Dental Extraction, A—G. H. Carriett	84	Gordon, L. L.—The Army Medical Services	145
Chemoprophylaxis, Malaria Control by Residual Spraying Reinforced by Short-Term—M. A. C. Dowling and R. D. Hughes	61	Hæmoglobin Levels and Helminthiasis in Malay Recruits—T. E. Field, P. J. Scheuer and C. R. Tribe	113
<i>Clostridium Welchii</i> Toxin Food Poisoning, An Outbreak of—J. G. P. Power and H. Lister	71	Hæmoglobin Levels of Students attending the Eastern Command Physical Training School, A Survey of—P. R. Holt	13
Command Transfusion Service, Some Practical Aspects of a—H. C. Jeffrey	101	Hazardous Anæsthetic, A—C. M. Campbell	135
CORRESPONDENCE:		Health Lessons of Cyprus, 1955–58, The—F. G. Neild	152
Barnsley, R. E.—The Romantic Purveyor	42	Helminthiasis in Malay Recruits, Hæmoglobin Levels and—T. E. Field, P. J. Scheuer and C. R. Tribe	113
Macfie, W. G.—Viral Encephalitis	90	Holt, P. R.—A Survey of Hæmoglobin Levels of Students attending the Eastern Command Physical Training School	13
Mackay-Dick, J.—Lung Resection for Tuberculosis	89	Holt, P. R., joint author. <i>See</i> Sayers, M. H. P.	127
Wright, D.—Dangers of the Enema	137	Hughes, R. D., joint author. <i>See</i> Dowling, M. A. C.	61
Cyprus, 1955–58, The Health Lessons of—F. G. Neild	152		
Dental Extraction, A Case of Surgical Emphysema Following—G. H. Carriett	84		
Dignan, A. P. and D. J. Reid—A Case of Bilateral Supracondylar Fracture of the Femur	25		

	PAGE		PAGE
Incidence of Abnormalities of the Toe Clefts among British Troops in Malaya, The—F. J. Ingham and T. A. G. Reed	182	Neild, F. G.—The Health Lessons of Cyprus, 1955–58	152
Ingham, F. J., and T. A. G. Reed—The Incidence of Abnormalities of the Toe Clefts among British Troops in Malaya	182	Non-Gonococcal Urethritis with Spiramycin (Rovamycin), The Treatment of—B. Levy	87
Jeffrey, H. C.—Some Practical Aspects of a Command Transfusion Service	101	Norcross, K.—Traumatic Effusion of the Knee: A Discussion	81
Knee: Traumatic Effusion of the—A Discussion—K. Norcross	81	Notice to Subscribers	191
Leece, J. D.—An Outbreak of Bacillary Dysentery in an Isolated Army Establishment	164	Obituary—Colonel R. N. Phease	41
Leptospirosis, Epidemiological Features of Malayan—R. W. Ross Russell	17	Oswald, Neville C.—Morale at the Base	97
Levy, B.—Scrub Typhus in the Differential Diagnosis of Venereal Disease	125	Outbreak of Bacillary Dysentery in an Isolated Army Establishment, An—J. D. Leece	164
Levy, B.—The Treatment of Non-Gonococcal Urethritis with Spiramycin (Rovamycin)	87	Outbreak of <i>Clostridium Welchii</i> Toxin Food Poisoning, An—J. G. P. Power and H. Lister	71
Liebeschuetz, H. J.—Respiratory Signs and Symptoms in Young Soldiers and their Relationship to Smoking	76	Paratyphoid B. Fevers, Salmonella Paratyphi BO Agglutinin Levels in—J. F. Watkins	167
Lister, H., joint author. <i>See</i> Power, J. G. P.	71	Physiological Problems of the Soldier in Tropical Warfare—An Operational Approach—E. T. Renbourn	172
Malaria Control by Residual Spraying Reinforced by Short-Term Chemoprophylaxis—M. A. C. Dowling and R. D. Hughes	61	Power, J. G. P. and H. Lister—An Outbreak of <i>Clostridium Welchii</i> Toxin Food Poisoning	71
Malaya and Hong Kong, Some Clinical Features of Ringworm in—D. Gill	120	Practice of Medicine: Past, Present and Future, The—Francis Fraser	1
Malaya, Incidence of Abnormalities of the Toe Clefts among British Troops in—F. J. Ingham and T. A. G. Reed	182	Preliminary Report on Encephalitic Type of Illnesses in Singapore, A—M. A. C. Dowling and H. E. Webb	28
Malayan Leptospirosis, Epidemiological Features of—R. W. Ross Russell	17	R.A.M.C., A Surgical Career in the—Comments by a Recent Entrant from Civilian Life	22
Malay Recruits, Hæmoglobin Levels and Helminthiasis in—T. E. Field, P. J. Scheuer and C. R. Tribe	113	Reed, T. A. G., joint author. <i>See</i> Ingham, F. J.	182
Mass Inoculation, A Trial of Methods for—M. H. P. Sayers, R. C. Stewart and P. R. Holt	127	Reid, D. J., joint author. <i>See</i> Dignan, A. P.	25
Masters, P. L., joint author. <i>See</i> Brumfitt, W.	38	Renbourn, E. T.—Physiological Problems of the Soldier in Tropical Warfare—An Operational Approach	172
MATTERS OF INTEREST:		Residual Spraying Reinforced by Short-Term Chemoprophylaxis, Malaria Control by—M. A. C. Dowling and R. D. Hughes	61
British Red Cross Society—Training in First Aid	138	Respiratory Signs and Symptoms in Young Soldiers and their Relationship to Smoking—H. J. Liebeschuetz	76
George Knight Clowes Memorial Prize Essay Competition, 1960	138	REVIEWS:	
Gold Medal and Trench Gascoigne Prize Essay Competition, 1959	138	Bailey, H.—Emergency Surgery (7th Edition)	140
Muniment Room at the Royal Army Medical College	138	Blackburn, G. and R. Lawrie (editors)—Textbook of Surgery. With a Foreword by Sir Russell Brock	139
Media for the Detection of Beta-Hæmolytic Streptococci, The Use of Selective—W. Brumfitt and P. L. Masters	38	Bowden, Ruth E. M.—Peripheral Nerve Injuries	142
"Medical Meilanion," Exercise—F. M. Richardson	49	Bramwell, C.—A Clinical Introduction to Heart Disease	143
Medical Services, The Army—L. L. Gordon	145	Brompton Hospital Reports. Vol. XXVI, 1957	93
Medicine: Past, Present and Future, The Practice of—Francis Fraser	1	Cantor, M. O. and R. P. Reynolds—Gastro-Intestinal Obstruction	92
Methods for Mass Inoculation, A Trial of—M. H. P. Sayers, R. C. Stewart and P. R. Holt	127	Clay, H. H.—The Public Health Inspector's Handbook	92
Morale at the Base—Neville C. Oswald	97	Coles, R. B. and P. D. C. Kinmont—Skin Diseases for Beginners	93

	PAGE		PAGE
Crew, F. A. E.—Medical History of the Second World War. (Army Medical Services Campaigns, Vol. II) ...	46	Salmonella Serotypes, Seven New—A Report from The David Bruce Laboratories ...	134
DeBakey, M. E., joint author. <i>See</i> Payne ...	139	Sayers, M. H. P., R. C. Stewart and P. R. Holt—A Trial of Methods for Mass Inoculation ...	127
Gelfand, M.—The Sick African (3rd Edition) ...	140	Scheuer, P. J., joint author. <i>See</i> Field, T. E. ...	113
Gordon-Taylor, G. and E. W. Walls—Sir Charles Bell—His Life and Times	44	Schistosomiasis Amongst Rhodesian Troops—J. F. Ainslie ...	131
International Standards for Drinking Water. Geneva: World Health Organisation, 1958 ...	141	Scrub Typhus in the Differential Diagnosis of Venereal Disease—B. Levy ...	125
Kinmont, P. D. C., joint author. <i>See</i> Coles ...	93	Selective Media for the Detection of Beta-Haemolytic Streptococci, The Use of—W. Brumfitt and P. L. Masters ...	38
Lawrie, R. (joint editor). <i>See</i> Blackburn ...	139	Seven New Salmonella Serotypes—A Report from The David Bruce Laboratories ...	134
Nabarro, J. D. N.—Biochemical Investigations in Diagnosis and Treatment ...	92	Singapore, A Preliminary Report on Encephalitic Type of Illnesses in—M. A. C. Dowling and H. E. Webb ...	28
Oliver, L. (editor)—Basic Surgery ...	189	Smoking, Respiratory Signs and Symptoms in Young Soldiers and their Relationship to—H. J. Liebeschuetz ...	76
Oswald, N. C. (editor)—Recent Trends in Chronic Bronchitis. Various authors ...	94	Some Clinical Features of Ringworm in Malaya and Hong Kong—D. Gill ...	120
Payne, T. F. and M. E. DeBakey—Cold Injury—Ground Type. (Medical Dept. U.S. Army in World War II)	139	Some Practical Aspects of a Command Transfusion Service—H. C. Jeffrey ...	101
Perkins, G.—Fractures and Dislocations ...	95	Spiramycin (Rovamycin), The Treatment of Non-Gonococcal Urethritis with—B. Levy ...	87
Proctor, D. F.—Anæsthesia and Otolaryngology ...	91	Stewart, R. C., joint author. <i>See</i> Sayers, M. H. P. ...	127
Pryor, W. J.—A Manual of Anæsthetic Techniques ...	191	Streptococci, The Use of Selective Media for the Detection of Beta-Haemolytic—W. Brumfitt and P. L. Masters ...	38
Reynolds, R. P., joint author. <i>See</i> Cantor ...	92	Surgical Career in the R.A.M.C., A—Comments by a Recent Entrant from Civilian Life ...	22
Roberts, L.—A Synopsis of Hygiene. (Jameson & Parkinson) (11th Edition)	190	Surgical Emphysema Following Dental Extraction, A Case of—G. H. Carriett	84
Sayer, J.—Aids to Male Genito-Urinary Nursing ...	142	Survey of Hemoglobin Levels of Students attending the Eastern Command Physical Training School, A—P. R. Holt...	13
Stafford-Clarke, D.—British Red Cross Society Mental Health Manual ...	143	Toe Clefts among British Troops in Malaya, Incidence of Abnormalities of the—F. J. Ingham and T. A. G. Reed	182
The Determination of the ABO and RH (D) Blood Groups for Transfusion. M.R.C. Memorandum No. 36	95	Transfusion Service, Some Practical Aspects of a Command—H. C. Jeffrey	101
The Extra Pharmacopœia, Vol. I (Martindale) ...	143	Traumatic Effusion of the Knee: A Discussion—K. Norcross ...	81
Tidy, H. and R. M. Walker (editors)—The Medical Annual (76th issue) ...	45	Treatment of Non-Gonococcal Urethritis with Spiramycin (Rovamycin), The—B. Levy ...	87
Wakeley, C. P. G. (editor)—A Synopsis of Surgery (Hey Groves). (15th Edition) ...	141	Trial of Methods for Mass Inoculation, A—M. H. P. Sayers, R. C. Stewart and P. R. Holt ...	127
Walker, A. S.—The Island Campaigns of Australia in the War of 1939–1945. Vol. III of Series Five (Medical) ...	47	Tribe, C. R., joint author. <i>See</i> Field, T. E.	113
Walker, Joan B.—The Nurse and the Diabetic ...	94	Tropical Warfare, Physiological Problems of the Soldier in—An Operational Approach—E. T. Renbourn ...	172
Walker, R. M. (joint editor). <i>See</i> Tidy	45	Urethritis with Spiramycin (Rovamycin), The Treatment of Non-Gonococcal—B. Levy ...	87
Walls, E. W., joint author. <i>See</i> Gordon-Taylor ...	44	Use of Selective Media for the Detection of Beta-Haemolytic Streptococci, The—W. Brumfitt and P. L. Masters ...	38
Rhodesian Troops, Schistosomiasis Amongst J. F. Ainslie ...	131		
Richardson, F. M.—Exercise “Medical Meilanion” ...	49		
Ringworm in Malaya and Hong Kong, Some Clinical Features of—D. Gill ...	120		
Russell, R. W. Ross Epidemiological Features of Malayan Leptospirosis ...	17		
Salmonella Paratyphi BO Agglutinin Levels in Paratyphoid B Fevers J. F. Watkins ...	167		

	PAGE		PAGE
Venereal Disease, Scrub Typhus in the		Watts, J. C.—Ambulance Légère ...	111
Differential Diagnosis of—B. Levy ...	125	Webb, H. E., joint author. <i>See</i> Dowling,	
		M. A. C.	28
Watkins, J. F.—Salmonella Paratyphi BO		Young Soldiers and their Relationship to	
Agglutinin Levels in Paratyphoid B		Smoking, Respiratory Signs and Symp-	
Fevers	167	toms in—H. J. Liebeschuetz	76

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